Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres. and Treas. ROB'T MCKEAN, Sec'y.
505 Pearl St., New York.
6 Bouverie St., London, E. C.
Unter den Linden 71, Berlin.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

During 1910 *we printed and circulated* 526,500 *copies of* THE ENGINEERING AND MINING JOURNAL.

Our circulation for January, 1911, *was* 41,500 *copies.*

February 4..... 11,000
February 11..... 10,000

None sent free regularly, no back numbers. Figures are live, net circulation.

Contents

PAGE

Editorials:
The Economics of Curtailment of Production 305
Fatal Accidents in Mining..... 306
British Columbia Mining Statistics... 306
Correspondence and Discussion:
The Symons Crusher .... Standards of Work....Proposed Amendment to Laws Governing Lode Locations.... 307
Mining and Metallurgical Society..... 309
Attempted Smoke Abatement in Saxony. *Jena Correspondence* 309
The Hamburg Metal Exchange..... 309
Utah Copper Company..... 309
Nevada Consolidated Quarterly Report.. 310
Details of Practical Mining:
*Converter Hood at Cerro de Pasco Smeltery....Filter Car for Concentrates ....*Goldfield Consolidated Fire Equipment....*The Nahl Intermittent Slime Decanter....*Device for Cleaning Flat Wire Cables ....*Reinforcing Mine Timbers with Old Wire Rope....Acid Treatment of Mercury at Florence-Goldfield Mill.... *Suggested Improvement in Lake Superior Miling Practice .... *Determining the Number of Cars Hoisted per Hour....Sounds in Gas Engines 311
*Small Heavy Duty Air Compressors... 315
The Motter Process..... 315
Explosion at Keating Mine..... 315
*The Symons Crusher..... 316
The Potash Salts Questions..... 316
Bill to Open Alaska Coal Lands..... 317
Report of De Beers Consolidated..... 317
*Air Currents and Shaft Plumb Lines. *George C. McFarlane* 318
Notes on the Rand Gold Mines. *Robert Peele* 320
*Gold Dredging in French Guiana. *Leon Delvaux* 323
The Gentle Art of Appreciation. *Mark R. Lamb* 325
Nomenclature of Iron and Steel.—I. *Henry M. Howe* 327
A New French Blasting Explosive..... 330
The European Markets for American Coal 331
Increased Use of Mining Machines..... 331
Explosion in Anthracite Mine..... 331
*Model Coal Mine at Marianna. *A. C. Beeson and Floyd W. Parsons* 332
Rules Governing Timbering in South Wales 335
Lignite Mining in Texas.....*Alvin Gray* 335
The Miner at Home.....*P. M. Greer* 336
Personal, Obituary and Societies..... 337
Editorial Correspondence..... 338
Mining News..... 340
Markets 346

**Illustrated.*

The Engineering and Mining Journal

FEBRUARY 11, 1911.

The Economics of Curtailment of Production

It is generally admitted that the great increase in the production of copper in 1908-09, and the accumulation of the large unsold supply are directly ascribable to the advent of the porphyry mines. They, themselves, have suffered from the resulting low price for copper, although they have been able to pay large dividends. Up to the middle of 1910, when curtailment was inaugurated, their managers apparently acted upon the theory that their ore supplies were so huge and their certain duration of productiveness was so long that it was the best policy to realize upon their reserves as quickly as possible, regardless of price, so long as there would be any profit; and their cost of production permits a profit at a very low price.

Leaving out of account whatever stock-marketing plans there may have been and confining attention to the simple question of supplying a commodity, the policy was fallacious for several reasons, as follows: (1) These orebodies, although huge, are not going to last forever, but on the contrary have already been delimited in some cases and are known to constitute a supply, at present rate of production, for only a rather moderate number of years; it is a misfortune for some of these fine mines to be exhausting the best part of their reserves at a relatively low price for copper. (2) In the case of those mines possessing a probable life of more than 20 years, it is highly doubtful if the development of adverse conditions in the extraction of the deeper portions of the deposits have been sufficiently taken into consideration, and it is dangerous to sacrifice present profit on the hypothesis that there is plenty left, even for more than 20 years. (3) Every threatening competition of established business has stimulated improvement in methods, often with the result of perfect ability to survive, and this has been distinctly the case among the older copper mines, so that now to drive them out of business the porphyry miners would have to force copper down to a price that even they would not care to face. The last consideration was probably the most cogent in bringing about the agreement to curtail last summer.

It is possible, however, that even yet the economic arguments in favor of curtailment when there be overproduction, have not been fully considered; or may not be generally understood.

It is a well established principle in the economics of mining that given a developed orebody the profit will be greatest the more quickly it be extracted. This principle may be applied without qualification only to gold mines, whereof the value of the product is not subject, at least not directly, to market fluctuations. In all other cases the principle of intensive production if generally adopted leads to such overproduction that for long periods profit may totally disappear. The great bituminous coal-mining industry in many parts of the United States suffers chronically from that condition, or something closely approaching thereto.

It does not follow from this that the remedy is either governmental control or industrial control by combination; on the contrary it may better be the individual operation of enlightened self-interest, such as always has been manifested by the Calumet & Hecla management.

Let us try to illustrate by some figuring, taking the case of a mine producing 50,000,000 lb. of copper per annum at an operating cost of 8c. per lb. Such a mine may be assumed to have cost $2,500,000 for property and $7,500,000 for equipment. The promoters who have raised those huge sums of money and the original investors who have supplied it, taking all the risks, will probably value the enterprise as a going and thoroughly proved concern at something like $20,000,000, a valuation that would be substantially warranted at let us say an average realization of 13½c. for the pro-

duct, the mine being able to maintain the estimated rate of production for 15 years. Many investors will doubtless have bought into the company upon that valuation.

But let us suppose that a good many new mines of the same class have been developed at about the same time, and that their combined production has exceeded the demand at even 12c. per lb., and that as the years run on the prospect of realizing an average of 13½c. over a series of 15 years becomes more and more slender. Shall we say "keep on production at the maximum of capacity and forego just profit in whole or in part?" Or shall we say that it is better to husband resources until the conditions of demand and supply become more favorable?

At 12c. for copper we have a margin of 4c. per lb. above operating costs, or $2,000,000 per annum. If we should reduce production by 25 per cent. we should reduce the margin in somewhat greater ratio, because the cost per pound of copper would rise more or less. However, we should be prolonging the life of the mine and should be contributing toward adjustment of supply to demand. Similar action by other producers would sooner or later cure the adverse conditions. Would a general curtailment of 25 per cent. increase the price by 25 per cent., or from 12c. to 15c.? Of course, no one can answer positively. Certainly a general curtailment by all producing mines is never to be expected, because there are always many operating at such a small margin that they must either produce at full capacity or at a loss. It might be argued that such mines would best be closed entirely to await more favorable conditions, but the actual cost of remaining idle is often a deterrent.

However, it is not irrational to expect that a curtailment of 25 per cent. by the leading producers would at least advance the price from 12c. to 13½c. How would this affect the imaginary company that we have taken for an example? Its cost of production would probably rise from 8c. to 9c. Its annual margin would be reduced from $2,000,000 to $1,687,500. But its life would be extended from 15 years to 20 years, and deducting the annuity required to redeem the principal ($20,000,000) in the respective periods, reinvested at 4 per cent., the net profit in one case would be $1,001,200 per annum for 15 years; and in the other case, $1,015,900 for 20 years. In other words there would be a gain of upward of $5,000,000 in the net proceeds of the mine.

These figures must not be taken as anything but illustrative. Some elements are purely speculative, especially the price for copper. But they may safely be taken as showing the foolishness of unrestrained overproduction, or any attempt to hog a market when exhaustion of limited resources is involved. In manufacturing a war to the knife may sometimes be good business, but in the mining of the commodity metals it is likely to be the policy of the spendthrift.

Fatal Accidents in Mining

Accidents, their cost and compensation for them, are the subjects of Bulletin No. 90 of the Bureau of Labor, recently issued. More than half the volume is occupied by an elaborate article on "Fatal Accidents in Coal Mining" by Frederick L. Hoffman, whose work in that direction is well known to those who have read his articles on that subject published in the JOURNAL for some 10 years past. Mr. Hoffman's work as actuary of a large insurance company led him to study first the comparative risks of various occupations, and from that to a special study of accidents in mining. How carefully and thoroughly he has done this is evident to everyone who has read his articles in the JOURNAL. Probably no one has ever made a more extensive compilation of the statictics of mining accidents or has studied a wider range of reports and other available documents.

Mr. Hoffman's work for the Bureau of Mines is in some measure free from the limitations of space imposed on his earlier articles, and he has been able to go into more detail and make more extensive comparisons. His conclusions are carefully drawn and entirely unbiased. He has studied the subject dispassionately, as an interesting industrial problem, and suggests no remedies beyond the obvious ones of greater care, better discipline, less haste and the preferment of thorough work to temporary and transient profit. His bulletin is well worth reading by all who are interested in mining.

British Columbia Mining Statistics

In the JOURNAL for Jan. 7 we published an article on the mineral production of British Columbia, by E. Jacobs, long our correspondent from that Province. In it the figures for the production were very fully given, although the manuscript was necessarily forwarded to us late in December, before the year was actually closed. We have now received the full text of the preliminary report of William Fleet Robertson, the provincial mineralogist, and the only corrections needed to the earlier report are a reduction of $114,000 in gold mined and a small increase in clay products, stone and other construction materials. The official total of $26,183,504 is only $190,000 more than Mr. Jacobs' remarkably close estimate.

Mr. Robertson's official "Preliminary Review" for 1910 is the first official report for that year to reach us. The completeness of its figures and comments shows how closely the statistics of British Columbia are collected and how promptly their arrangement and tabulation are completed. Possibly some small corrections will be made at a later date; but the early issue of a report of this kind is of very great benefit to any mining country. The presentation of approximately complete statistics in a very short time after the close of the year—the report is dated Jan. 2, 1911—requires close, careful and intelligent work. It is of far more value to the mining community and to the trade than a report in minute detail presented a half-year or a year later, as is the custom with too many official reports.

Some interesting notes on the Transvaal mines are given in Professor Peele's article on page 320 of this issue of the JOURNAL. The various phases of work on this great goldfield have been exhaustively considered by British engineers, but it is interesting to have the impressions of a visitor reviewing in more concise form the features that were of particular interest to an American engineer. A point of practice which has probably escaped the notice of many not intimately connected with this field is the tendency toward the abolishment of continuous hoisting in the "turned-vertical" shafts and the substitution of stage hoisting.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

The Symons Crusher

H. L. Wollenberg's article in the JOURNAL of Sept. 10, 1910, comparing gyratory and jaw crushers, failed to take into consideration a radically new type of gyratory crusher which has come into use during the last four or five years. This new crusher may be called a "fixed pillar" as opposed to the "gyrating shaft" crusher. The fixed-pillar gyratory crusher was first introduced into the West for mill work by me about 18 months ago, although it had previously been used by contractors and cement works for three years. There were some attractive features to the crusher: first, its compactness, its hight being little more than that of a Blake crusher; second, the entire absence of the gyrating shaft, the shaft of this crusher being stationary and forming merely a pillar about which revolves the eccentrically mounted crushing head.

Mr. Wollenberg has mentioned several disadvantages inherent to the gyratory, and among them he mentions the hight, weight, complication, expense of maintenance and wear of concaves. These points I will take up in detail. The appended tables compared with those published in Mr. Wollenberg's article, will greatly reduce the advantages of the Blake over the gyratory. For example, the 12x88-in. gyratory corresponds in size with the 12x94-in. fixed-pillar gyratory, but the hight from the foundation to the feed platform is only 4 ft. 7 in. Of course, here the question of chutes leading from the crusher may affect this hight, but, even so, it has an advantage of more than two feet over the gyrating-shaft crusher.

This crusher is practically as simple as the Blake, for in doing away with the gyrating shaft and suspension head of the usual type of gyratory crusher, no parts are introduced to take their place. This materially reduces the cost of repairs. In babbitting the eccentric the metal is placed around the eccentric in curved slabs already formed and finished so no hot metal is handled, and rebabbitting may be done in a few minutes. The wear on concaves and crushing head has been materially diminished by making the concaves of curved section instead of practically straight. This curved section gives a much greater length to the throat of the crusher where most of the crushing is done, not only distributing the wear over a greater surface, but giving at the same time a surface which can be worn down to a much greater depth without materially affecting the size of the opening. Furthermore this construction prevents the congestion of material at the throat, giving a larger capacity when crushing to small sizes.

The weight of this crusher is little more than, and in most cases even less than, that of the corresponding size of Blake crushers. For instance, the 12x94-in. fixed-pillar gyratory weighs less than 16 tons against 15 tons for the Blake.

I have accepted the capacities given by Mr. Wollenberg, though in some cases my experience would allow a larger tonnage, particularly to the gyrating-shaft crusher. The capacities I have allowed the fixed-pillar gyratory are all results I have obtained under reasonably hard conditions, and under easy conditions of crushing I have seen these outputs increased from 33⅓ to 75 per cent. It is never necessary to get under the fixed-pillar crusher for repairs, as all repair work is done from the top and there is no part that needs to be handled that is much over half the weight of the shaft of the gyrating-shaft crusher.

My excuse for this letter is the fact that evidently Mr. Wollenberg had never seen this crusher or he would have included it in his comparison. It is giving remarkable service in mill work, and none of those whom I have persuaded to install this crusher has the slightest regret. In fact, it is the consensus of opinion that this crusher combines the obviously desirable qualities of the gyratory crusher with the compactness and low maintenance cost of the Blake.

BENEDICT SHUBART.

Denver, Colo., Jan. 25, 1911.

TABLE OF DATA FOR BLAKE CRUSHERS, GYRATING-SHAFT AND FIXED-PILLAR GYRATORIES.

Crushing from.....	7 in. to 1½ in.			10 in. to 1¾ in.			12 in. to 2½ in.			14 in. to 3½ in.
Type of crusher.....	Blake.	G.S. Gyratory.	F.P. Gyratory.	Blake.	G.S. Gyratory.	F.P. Gyratory.	Blake.	G.S. Gyratory.	F.P. Gyratory.	F.P. Gyratory.
Size of feed opening in inches.....	10x7	7x56	7x64	20x10	10x80	10x80	24x12	12x88	12x94	14x108
Capacity tons per hour.	4	7	15	12	30	40	25	70	80	130
Weight in tons.....	4	8	5	9	18	8	15	24	16	23
Hourly capacity ÷ tons weight.....	1	0.87	3	1.25	1.66	5	1.67	2.91	5	5.6
Installed horsepower...	8	12	15	20	25	32	30	50	50	70
Hight in feet.....	3	5½	3	3	7½	3¾	5	8	4½	5½
Width overall in feet...	6½	10	8¾	7	13	10	8	13	10	11½
Length overall in feet...	5½	5	5½	9	6	6½	10	6	7	9½

Standards of Work

Referring to Mr. Dolbear's letter in the JOURNAL of Sept. 3, 1910, on the subject of "Standards of Work," he appears to be unduly pessimistic as to the value of such data. In my original communication I particularly emphasized the necessity for the most complete and itemized information, with every possible influencing factor indicated. The notes subsequently furnished by A. O. Christensen in the JOURNAL of Sept. 17, 1910, are examples which, I venture to believe, are quite valuable for comparison with similar work elsewhere. To men in remote camps, particularly in foreign countries, such data are obviously criteria that may guide them in their own work.

COMPARING WORK DONE UNDER WIDELY DIFFERENT CONDITIONS

The personal factor is one of the most important, but however different the methods employed, most of us hold our positions by our ability to get results, and the variation from one camp to another, on this account, should not be so great as to prevent all possibility of comparison. With the Latin-American one does not expect to make world's records in drifting for example, but it is worth finding out if what can be done with such labor bears a ratio to the money they earn, as compared, say, with North American miners, under more or less similar conditions.

Below I give some data, from my own experience at a Mexican mine, and at those in the Argentine at present under

my management. It will be seen that it is quite possible to compare the two sets of results. On a mine the two items of greatest expenditure are for development and mining; in both of these, payments for labor are more than 50 per cent. of the totals, in the majority of cases. Although results at one mine may vary widely from those at another due to the personal element presented by the human beings who provide the motive power in the form of muscular effort and moral persuasion, yet a basis of comparison is afforded by means of units of length and weight, although not an exact standard.

Personally I have found such "standards," however inadequate, of the greatest use, particularly with native labor. The following notes are given as briefly as possible and refer to development work only; hand drilling in comparatively narrow veins, from 2 to 6 ft. wide with almost perpendicular walls; in each case the drifts are about four feet wide and six feet high; winzes and raises are a little larger, depending on the distance from hanging to foot-wall.

TABLE 1. DEVELOPMENT COSTS AT A MEXICAN MINE.

Weeks. From	Weeks. To	Total Meters of Development.	Cost of Drilling Only, Pesos.	Average Monthly Progress per Man per Shift, Cm.	Average Number of Working Places.	Approximate Progress per Working Place per Month, Meters.	Remarks.
5	9	155.58	20.89	12.9	12.2	12.7	
10	13	141.30	19.78	16.1	12.7	11.5	
14	18	182.65	19.17	17.5	13.5	13.6	
19	23	223.25	17.28	19.5	12.0	18.8	Over 50 per cent. day and night.
24	27	193.10	16.78	19.9	12.7	15.2	
28	31	151.80	15.81	18.8	12.5	12.2	Decreasing number of workings on day and night shifts.
32	36	144.00	15.91	17.4	10.8	13.2	
37	40	133.70	16.51	18.9	11.0	12.4	
41	44	98.80	15.70	20.1	9.7	10.9	Working on day shift only.
45	48	81.80	13.30	20.7	8.0	10.2	

Conditions in the Mexican Mine

The Mexican Mine—Double-hand drilling, 7/8-in. and 3/4-in. steel; long-handle 8-lb. hammers; 40 to 60 per cent. dynamite (Mexican), depending on the ground; mine perfectly dry, but rather hot and poorly ventilated; 8 working hours in a shift, with one-hour interval; soft ground in some places, extremely hard in others, but the average would be considered tough rather than hard; fairly clean hanging-wall to break to. Maximum progress in softer drifts, occasionally over 30 cm., or about 12 in., per man per shift, but usually a little less; in hardest ground as low as 10 cm., or about 4 in., per man per shift. Maximum progress in a single drift in a week of 11 shifts, with three men on day and two on night shift, from 9 to 10 m., never over and usually about 108 inches of drilling per man per shift in softest ground and 36 to 42 in. in the hardest. The average progress of all classes of development per man per shift in the year previous to my management was 11.9 cm., or a little less than 5 in., most of the work having been done on day's pay. In the subsequent year, as shown in Table 1, it will be seen how close is the relation between the total cost of drilling and this rate per man.

Data from an Argentine Mine

The Argentine Mine—Single-hand drilling; 6-lb. hammers in soft ground and 8-lb. in harder rock; short handles, about 6 in.; most of the drilling dry upper, or down holes with water; 7/8-in. steel only, gaged to 1 3/8 in., 1 1/4 in. and 1 1/8 in.; 125 in. of drilling per man per shift in soft ground; 60 to 80 in. in the hard black andesite (dike) of the hanging-wall or the tough granite of the foot-wall; 8 to 10 working hours in a shift, with one-hour interval. Progress per man per shift, 30 to 40 cm., or about 12 to 16 in., depending on the class of miner, the higher figure being required to make good wages; in hardest ground such as the granite or dike rock, 12 to 18 cm., or about 5 to 7 in. Usual progress in drifts, day and night shift, one man on each, exclusive of Sundays, about 50 to 60 ft. per month in the softer ground, and between 20 and 30 ft. in the hardest. The elevation of these mines, a little over 10,000 ft., induces a good deal of sickness and prevents the maximum of work possible at a lower altitude. Only comparatively young men are able to make good wages, on the usual contract prices. The powder used is gelignite in soft ground and blasting gelatin of English manufacture in the hardest. The contractors take out daily 8 to 12 sticks (7/8 inch diameter) per shift, depending on the ground; holes are loaded at the rate of one stick per foot in soft, to twice this amount in the harder ground. It should be stated that the mine is quite dry in the upper levels; when the ground is wet it is usually softer, and so the disadvantage is counterbalanced. The workings are cool but the air is often so bad that only acetylene lamps will burn; this does not affect the efficiency. It will be noted that the above figures appear to be in favor of single-hand drilling.

It is worth while pointing out and emphasizing that the most essential criterion, as regards development work, is the rate of advance per man per shift, and this applies whether it be single-, double-hand or machine drilling.

A. Livingstone Oke.

Rodeo, San Juan, Argentina, Dec. 12, 1910.

TABLE 2. COMPARISON OF MEXICAN AND ARGENTINE MINE WORK.

	Mexican Mine.	Argentine Mine.
Method of drilling	Double-hand	Single-hand
Weight of hammers	8 lb. (long handles)	6–8 lb. (short handles)
Size of drill steel	3/4 and 7/8 in.	7/8 in.
Make of powder	40 and 60 per cent. Mexican	Gelignit, Gelatin } English
Number of working hours per shift	8	8–10
Earnings of men: Contracting, pesos	2.50@4	2@3.50
Day's pay, pesos	2	2
Contract rates per meter (Soft ground, pesos	12@16	9@15
Drifts and crosscuts only (Hard ground, pesos	Up to 30	Up to 25
Average rate of progress per man per (Soft ground	25–30 cm.	30–40 cm.
shift, in drifts and crosscuts (Hard ground	10 cm.	12–18 cm.
Inches of drilling per (Soft ground	108	125
man per shift (Hard ground	36–42	60–80

Note.—The Argentine peso is about 1/10 less in value than the Mexican.

Proposed Amendment to Laws Governing Lode Locations

The unquestionable necessity of an amendment to the Mineral Land laws is so apparent that when an article setting forth its stipulations is so well founded as that contained in the Journal of Dec. 31, 1910, page 1290, by George A. Packard, an acknowledgment of its approval by those interested seems in place.

In addition to the proposed amendment of Sec. 2324, Revised Statutes, as suggested by Mr. Packard, I would add that all lode locations of mining claims have a stake at least four inches square set at each angle of each location, with the initials of the name, the approximate relative position to the location by course, and consecutive number scribed in the wood, and so recorded.

Whenever marks are placed with pencil they are soon obliterated by the elements. From my experience in mineral-land surveying it is evident that many promiscuously standing stakes with seldom any means of identification, make it both expensive and troublesome to surveyor and claimant, as well as to the claimant of the conflicting locations, when, by a few minutes' time spent in first setting these corners to a location many difficulties resulting from the usual custom of setting lode-location stakes would be avoided.

F. H. Colpitts.

Gates, Ore., Jan. 23. 1911.

Mining and Metallurgical Society

At the annual meeting of the Mining and Metallurgical Society of America, in New York, last month, some interesting addresses were made.

S. J. Jennings took as his theme the subject of waste. He referred to the losses of material that are suffered in our mining and metallurgical practice, and called attention to a loss that was generally neglected, viz., the loss of time and waste of effort that are involved in doing the same thing over and over again. This is due largely to the absence of reports of failures as well as of successes. The latter are almost always put on record; not so the failures. But if they were, much time and money would be saved in the avoidance of misleading paths. Mr. Jennings concluded with a plea for conservation in this respect.

Prof. A. L. Walker described a new process of melting cathode copper under a cover of boron trioxide, i.e., fused borax glass, which in some mysterious way deprives the copper of oxygen, or rather prevents copper, while in a molten condition, from absorbing oxygen. The copper treated by this process, which is being experimented upon on a large scale by one of the big copper refineries, acquires a higher degree of conductivity than ordinary electrolytic copper, and the process offers other advantages from an operating standpoint. The doubtful points in the process, however, are the chance for volatilizing borax glass, which is used as the cover, and the extra amount of heat required to melt copper under such a nonconducting cover. Professor Walker exhibited specimens of metal and slag and after suggesting a theory for the action of boron trioxide in this connection requested other explanations, but none were offered.

Prof. R. H. Richards presented the results of some laboratory experiments by his students in the comparative results obtained in classification under free-falling and hindered-settling conditions, respectively. He described the laboratory apparatus, which consisted of a galvanized-iron spitzkasten with 12 classifying tubes on the lower side. The tubes in the free-falling classifier were 2 in. long, of ½-in. diameter, and were without constriction of any sort. In the hindered-settling classifier, a teeter chamber, 1 in. diameter and 2 in. deep, was placed above the classifying column, which was of the same size as in the other classifier. By comparing the results obtained on screen analysis of the several products, the hindered-settling classifier was proved to perform much more perfect classification than the free-falling classifier. The concentrates were almost all recovered in a nearly pure state, the tailings rejected were almost devoid of heavy mineral, and only a small quantity of middlings resulted.

S. H. Chauvenet next described the occurrence of tin ore at Camp Florella, near El Paso, Texas, and the development operations that he is carrying on at that place. An animated discussion of some of the problems involved in this enterprise followed. Mr. Chauvenet added to the interest by showing samples of ore and products, including one of pig tin that has already been made in Texas. W. R. Ingalls described briefly, in answer to an inquiry of Mr. Chauvenet, the occurrence of tin in Durango, Mex., which he said was in rhyolite tuff and quite different from the occurrence near El Paso, as described by Mr. Chauvenet and indicated by his samples.

Attempted Smoke Abatement in Saxony

JENA CORRESPONDENCE

On Aug. 7, 1908, the Saxon minister of finance offered two prizes in the matter of prevention of injury to agricultural and forestry pursuits by smoke from furnaces and other industrial appliances, substantially as follows: (1) One prize of 2000 marks ($500) to be awarded to the author of the best essay on the subject, compiled from the all extant home and foreign professional literature. (2) One prize of 10,000 marks ($2500) to be awarded to the person best solving the problem by an invention, which must be of such a character that an unskilled workman can manipulate the apparatus required by it. The money was to be paid to the inventor after a lapse of two years, during which the invention was to be thoroughly and satisfactorily tested. The inventor could make an unlimited use of his invention. The writings of the candidates must be in the German language and seven copies were to be filed with the minister at Dresden before Dec. 31, 1909.

The Saxon government appointed a committee of 30 judges who selected a number of experts of the highest standing to assist them in passing upon the merits of the labors of the candidates.

The first offer received no response at all. For the second there was, of course, a scramble, but the committee was unable to find a single one of the proposals fit to be awarded a prize. Most of the candidates had, in utter disregard of the specifications of the minister of finance, which explicitly required the entire removal from the smoke of the acid gases so destructive to plant life, directed their attention to the comparatively innocuous soot nuisance. The rest of the candidates had designed apparatus for washing the waste gases which were encumbered with technical imperfections and would not stand the test.

The committee in handing its decision to the minister of finance recommended the appointment of a permanent commission, the business of which would be to keep an eye on and investigate any further inventions on the subject, and to encourage technical high schools and recognized technical authorities by granting them awards for prominent work in that line.

The Hamburg Metal Exchange

The Hamburg Metal Exchange, which, with 1910, completed the first year of its existence, has already attained considerable importance, which seems to be destined to increase. The contracts negotiated through the brokers' bank, allied with the brokers' association, are estimated to have amounted, in 1910, to between 70,000 and 80,000 tons. Under the system inaugurated at Hamburg, contracts are continued at advances corresponding substantially to the cost of carrying the copper, which has the effect of reducing the market to the basis of prompt delivery. A warehouse concern, with the exclusive right of issuing warrants, has been established. Generally speaking, the quotations at Hamburg in 1910 followed the fluctuations of the London market, but at times they moved to a lower level, the difference occasionally being large enough to enable London to buy with profit at Hamburg. The business at Hamburg is chiefly in electrolytic copper.

Utah Copper Company

The report of the Utah Copper Company for the quarter ended Dec. 31, 1910, shows a total profit for the quarter of $1,290,303, of which $901,017 resulted from Utah Copper mining and milling operations, $375,187 from Nevada Consolidated dividends and $14,099 from miscellaneous sources. Of this profit, $1,171,949 was distributed as dividends, and $118,354 carried to profit and loss. These earnings were based on 12½c. copper. The average cost per lb. of copper was 8.227 cents.

The Magna plant was in operation during the entire quarter, while about one-third of the Arthur (old Boston Consolidated) plant was down for the entire period, and all of it for short intervals, either because of the reconstruction, or because the Magna plant was capable of handling the entire tonnage. The first entirely remodeled section of the Arthur plant will be ready to run shortly after Feb. 1, 1911.

The total copper produced in concentrates for this quarter was: Oct., 7,582,-219 lb.; Nov., 7,468,915 lb.; Dec., 7,137,-585, a total of 22,188,719 lb. The total production, by quarters, for the year was: First, 18,511,819 lb.; second, 25,-124,052.; third, 23,194,921 lb.; fourth,

22,188,719 lb.; which gives as monthly averages for the four periods, 6,170,606 lb., 8,374,684 lb., 7,731,640 lb.; and 7,396,239 lb. respectively. These figures do not include 1,339,019 lb. produced in January, 1910, by the Boston Consolidated Copper Company. Including this, the 1910 production totaled 90,358,530 lb. of copper in concentrates; without it, 89,019,511 lb. The average grade of the ore was 1.56 per cent. copper and about 80 per cent. was steam-shovel production, and 20 per cent. from underground workings.

The outlook is still that the Bingham & Garfield Railway will be completed before June 30, 1911. Practically all of the open grading is completed, and most of the track material is on the ground, and a large proportion has already been laid. The steel bridges are in process of erection, and the rolling stock has been contracted for.

Iron Making in the United States

The capacity of all of the iron furnaces in the United States at the beginning of 1910 was estimated at 36,000,000 long tons. At the end of the year it was higher, some estimates being as high as 40,000,000 tons, but that figure is probably an overstatement. Anyway, furnaces can never be operated at full listed capacity, inasmuch as a considerable percentage must always be down for repairs.

Apropos of the recent increase in iron-making capacity and changes in the industry, the *Evening Post* reports a man who was raised on pig iron and knows the iron trade much better than he knows the stock market as saying: "Wall Street perhaps does not allow for the fact that it has to judge the condition of the steel trade from the statistics of the United States Steel Corporation, which controls less than half the country's capacity, and may be doing at the present time less than its proportion of the business going. There are no statistics to show what the independents are doing. I know 20 mills you never heard of that are running almost full. The trade is undergoing a kind of readjustment.

Though mills can buy pig iron today at the cost of production or less, they cannot afford to handle cold pig iron any more. It costs $2.50 per ton to melt pig iron. This cost the Steel Corporation saves by never letting its pig iron cool. It has one continuous process of conversion. Now the independent mills are going into the blast-furnace business in order to produce their own pig iron and be able to convert it from the molten state. That accounts for the continued increase in pig-iron capacity, though there is no longer any profit in the cold iron at current prices. This change leaves the old pig-iron producers in a dilemma. They are rich. They say, 'Very well, we will go into the finishing business ourselves,' so they build converting mills. Thus it works both ways. The mills go in for pig iron and the pig-iron people go in for mills, and the country's over-capacity is being continually increased. I should guess steel prices would be lower in the next few years than in the past five or six, but all the same there may be a lot of steel business doing."

January Dividends

The accompanying table shows the amount per share and total amount of dividends paid in January, 1911, by a number of mining companies in the United States, Canada, Mexico and Central America, and by industrial and coal companies in the United States.

U. S. Mining Companies.	Situation.	Amt. per Share.	Total Amt. Paid.
Acacia, g	Colo.	$0.00½	$7,194
Am. Zinc, Lead & Sm	Kan.	0.50	40,060
Anaconda, c	Mont.	0.50	81,750
B'nker Hill & Sul., s.l.	Ida.	0.25	300,000
Continental Zinc	Mo.	0.50	11,000
Copper Range, c	Mich.	1.00	384,185
Frontier, z.l	Wis.	3.00	3,750
Goldfield Con., g	Nev.	0.50	1,779,424
Guggenheim Expl.	U. S.	2.50	519,832
Hecla, s.l	Ida.	0.02	20,000
Homestake, g	S. D.	0.50	109,200
Jamison, g	Col.	0.02	7,800
National Mines, g	Nev.	0.16	120,000
New Idria, g	Cal.	0.70	70,000
North Butte, c	Mont.	0.30	123,000
Old Dominion M. & S., c	Ariz.	0.50	81,000
Osceola, c	Mich.	4.00	384,600
Quincy, c	Mich.	1.00	110,000
Shattuck-Ariz., c	Ariz.	1.00	350,000
Sioux Con., l.s.g	Utah	0.04	29,855
Tennessee Copper	Tenn.	1.50	300,000
Tonopah-B'lm'nt, s.g.	Nev.	0.15	225,000
Tonopah of Nev., s.g.	Nev.	0.40	400,000
Vindicator, g	Colo.	0.03	45,000

U. S. Industrials.	Situation.	Amt. per Share.	Total Amt. Paid.
Am. Coal Products	U. S.	$1.62½	$169,299
Am. Sm. & Ref., pf.	U. S.	1.75	875,000
Am. Sm. & Ref., com.	U. S.	1.00	500,000
Central C. & C., com.	Mo.	1.50	76,875
Central C. & C., pf.	Mo.	1.25	23,437
Consolidation Coal	Md.	1.50	295,370
General Chem., pf.	U. S.	1.50	150,000
Inter'l Nickel, pf.	U. S.	1.50	133,689
Island Creek Coal	U. S.	1.50	75,000
Monon. R. Coal, pf.	Penn.	1.00	100,000
National Lead, com.	N. Y.	0.75	154,915
Pittsburg Coal, pf.	Penn.	1.75	371,262
Pocahontas Con., pf.	W. Va.	3.00	84,000
Republic I. & S., pf.	Ala.	1.75	357,29¢
Sloss-Sheffield S. & I., pf.	Ala.	1.75	117,250
U. S. Sm., Ref. & Min., pf	U. S.	0.87½	425,286
U. S. Sm., Ref. & Min., com	U. S.	0.50	175,505
Va.-Car. Chem., pf.	Va.	2.00	360,000

Foreign Mining Companies.	Situation.	Amt. per Share.	Total Amt. Paid.
Buffalo, s	Ont.	$0.05	$50,000
Crown Reserve, s	Ont.	0.15	262,500
Dolores, g.s	Mex.	0.22½	90,000
Dominion Coal, com.	U. S.	1.00	130,000
Dos Estrellas	Mex.	2.50	750,000
El Rayo, g.s	Mex.	0.17½	63,003
Esperanza, g	Mex.	0.36	116,188
Guanajuato Dev.	Mex.	3.00	30,000
La Rose, s	Ont.	0.10	149,840
McKinley-Dar.-Sav.	Ont.	0.15	337,154
Nipissing, s	Ont.	0.37½	450,000
Nova Scotia S. & C., com	N. S.	1.25	75,000
Nova Scotia S.&C., pf.	N. S.	2.00	20,600
Right of Way, s	Ont.	0.02	33,710
Temiskaming	Ont.	0.03	75,000
Trethewey S. C., s.	Ont.	0.10	100,000

Nevada Consolidated Quarterly Report

The report of the Nevada Consolidated Copper Company for the quarter ended Dec. 31, 1910, shows dividends of $749,347, net credit to profit and loss of $160,150, and depreciation allowed on the Steptoe smeltery of $137,030, thus accounting for the total profit of $1,046,527 earned during the quarter. Production of copper was as follows: Oct., 4,980,306 lb.; Nov., 5,207,353 lb., and Dec., 5,510,936 lb.; total, 15,698,595 lb. This gives an average of 5,232,865 lb. per month, or about 15 per cent. under the 6,033,419 lb. per month of the third quarter of 1910.

The ore treated during the quarter averaged 2 per cent., and the cost, after allowing for depreciation on the Steptoe smeltery was only 6.7c. per lb. of copper. The condensed balance sheet is shown in an accompanying table. The amount previously shown in surplus account, charged against ore extracted, has been transferred to "undivided profits," and the surplus now represents the full amount received for securities in excess of par value, or cost.

BALANCE SHEET AS AT DEC. 31, 1910.

Assets.	
Property	$5,443,683
Development and equipment	782,934
Deferred charges	1,377,999
Investments	10,900,000
Materials and supplies	251,579
Accounts collectible	276,904
Metals on hand and in transit	3,010,444
Cash	207,082
	$22,250,625
Liabilities.	
Capital stock issued	$9,991,500
Bonds outstanding	500
Accounts payable	681,658
Unpaid treatment on metals	464,761
Metal price reserve	51,813
Surplus	9,027,437
Undivided profits	2,032,956
	$22,250,625

[If the ore milled during the quarter carried 2 per cent. of copper and a recovery of 70 per cent. be assumed, the tonnage of ore treated per month was 186,888, or about 6200 tons per working day.—Editor.]

Curious Effect of Explosion

The effects of the recent explosion of the magazine of the Granite mine, at Victor, Colo., were shown in some curious ways. There were 89 large plate-glass windows in the town broken. A correspondent writing from there says, the damage was caused by concussion, not by flying missiles. The force of the explosion seemed to travel in waves, like those of sound, and took out about every other plate-glass window. The Portland Gold Mining Company has an office building with two doors and a large double window between them, facing the Granite magazine. The two doors were both blown from their hinges and one split its full length. The window escaped without a crack.

Details of Practical Mining

This department is designed to treat in a brief way of details of everyday practice. Many readers are doing interesting things in mining and milling that other readers like to know about. The thought that there is nothing new in them should not be a deterrent of telling about them. Something that is an old story in one district may be quite unknown in another. Our draftsmen can develop any kind of a pencil sketch that is intelligible. A blueprint answers all the purposes of the engraver. Contributions are solicited.

Notes of Interest to Prospectors and Operators of Small as well as Large Mines Things that have to be done in Everyday Mining

Converter Hood at Cerro de Pasco Smeltery

BY CHARLES F. SHELBY*

The accompanying illustration shows a converter hood that has been installed at the Cerro de Pasco Mining Company's smeltery during the last few months. This illustration does not show the new ladles recently described in the JOURNAL, as they arrived after the photograph was taken. The main feature about this converter hood is that it is a radical departure from the present trend of design for this machine, and has gone back in principle to that which was practically abandoned seven years ago by all the new smelteries that have been built since that date. Since that time all kind of efforts and mechanical appliances have been introduced so that the hood would be movable and could be pushed back out of the way when changing the converters. This hood is absolutely stationary, thereby avoiding all complications in design, and is giving equally as good satisfaction, if not better, than any other I have ever had anything to do with.

ARRANGEMENT OF CONVERTER HOODS AT THE CERRO DE PASCO SMELTERY, LA FUNDICION, PERU

*Late general superintendent of smelting works, La Fundicion, Peru.

Filter Car for Concentrates

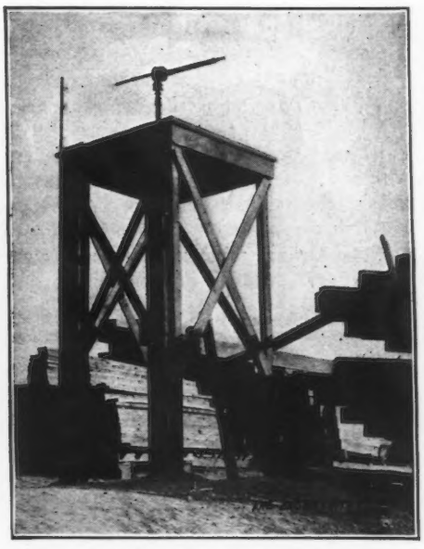
When wet concentrates are loaded into a small car, and trammed a long distance some of the concentrates stick to the sides, when the car is dumped. This difficulty is overcome at the North Star mills at Grass Valley, Cal., by placing a filter in the car, which allows some water to drain from the concentrates, during the tramming. The filter prevents the forming of a vacuum back of the concentrates, so the concentrates dump readily out of the cars and do not stick.

The filter is made of a layer of cocoa matting laid against the side of the car with a cover of burlap over the cocoa matting. This is held in place by a covering of 4-mesh, coarse-wire screening which is stiffened by ribs of 1x⅛-in. flat iron, riveted to the screening at 11-in. centers. To allow the water to drain out from behind the filter, holes are bored in the bottom of the car.

Goldfield Consolidated Fire Equipment

BY CLAUDE T. RICE

Since the fire in April, 1910, did such serious damage to the Goldfield Consolidated mill, the company has been spending a considerable sum of money in installing a comprehensive fire-fighting equipment. As the square-set method of timbering is used, it is necessary to keep a supply of timber at the sawmill. This timber is protected by means of several hydraulic monitors, mounted on platforms, high enough for the operator to get a good view of the yard, in a manner similar to that adopted at most of the big sawmills on the Pacific coast. An accompanying illustration shows one of these monitors mounted on its platform.



FIRE MONITOR IN GOLDFIELD CONSOLIDATED LUMBER YARD

The monitor used, made by A. J. Morse & Son, is much cheaper and less elaborate that most monitors put on the market; it costs only $15, while others sell for about $150. They have a 2-in. inlet and 1-in. discharge pipe; the pressure is 120 lb. per sq.in.; as the monitors discharge about 350 gal. per min. at a pressure of 80 lb. at the orifice, they have a range of about 150 feet.

At the shaft and buildings there are hydrants with lines of 2-in. hose coiled nearby. At each mine and at the mill are fire stations, where are kept hose carts, ladders, a 40-gal. chemical barge, picks and fire lanterns, all sealed in place to prevent being tampered with. All hydrants are kept sealed, so it is easily discovered if they have been tampered with, when they are inspected, about once

a week, for if the water were turned off at one of these places, it might take several minutes to discover the difficulty, during which time the fire would be making headway.

Sprinkler System Used in the Mill

As the floor and much of the interior construction of the mill are of wood, there are 16 connections for hose. Under the ore bins, where there is a possibility of a fire starting and gaining considerable headway before being discovered, a sprinkler fire-extinguishing apparatus is installed. The main water line is carried on the trestles of the railroad that connects the mines with the mill, and there are numerous hydrants for hose connections at each trestle. The reservoir feeding this system is on top of Columbia mountain, and has a capacity of 146,000 gal. There is a pump supplying the reservoir at the rate of 120 gal. per min. from a tank holding 30,000 gal. The tank is replenished at the rate of 100 gal. per min. In the fire-prevention equipment there are 11,500 ft. of 5-in. pipe, 5000 ft. of 4-in. pipe and 10,000 ft. of 2½- and 1-in. pipe, a total of 26,000 feet.

Comparatively speaking, the amount of water available for underground fires is small. In contending against such fires, reliance would have to be placed upon bulkheads, so placed as to keep the fire within a restricted area. The mines are inspected after each shift for the discovery of incipient fires. At each mine there are two Dräger mine helmets with electric lamps, capable of running for 12 hours.

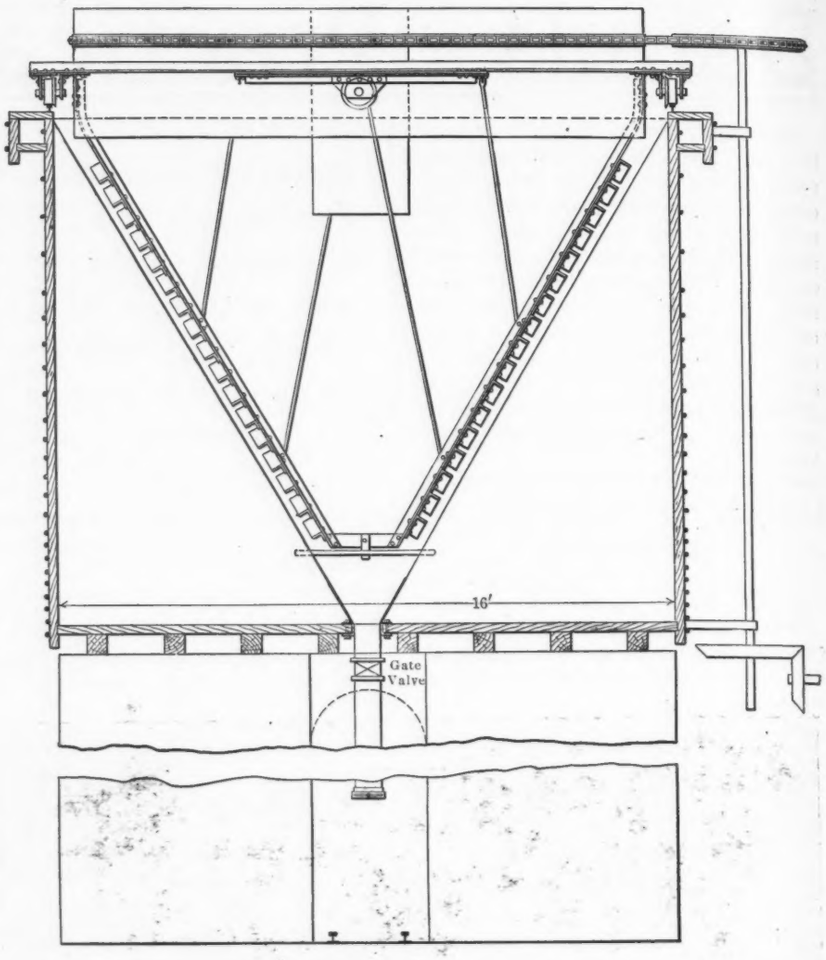
The Nahl Intermittent Slime Decanter

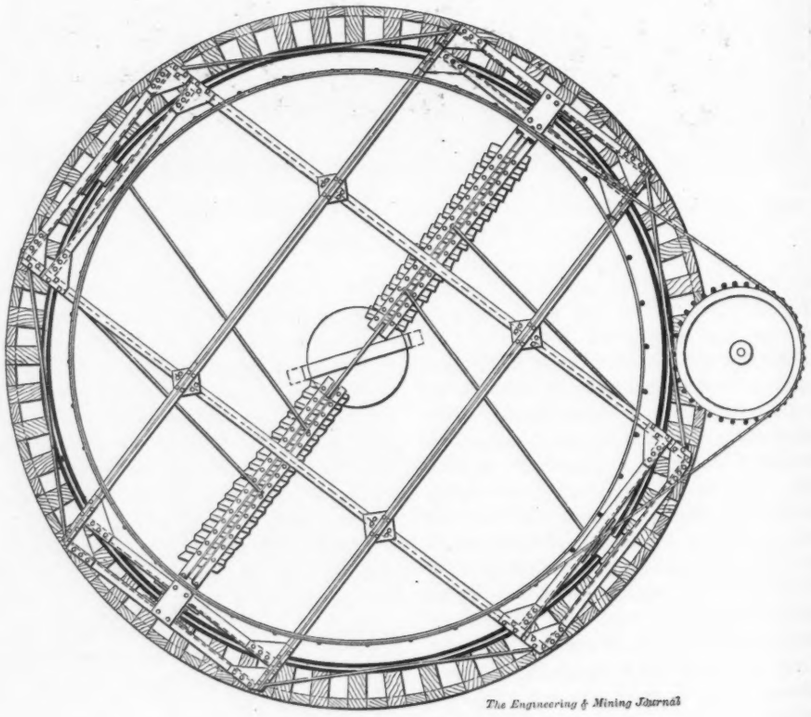
By Arthur C. Nahl*

In the accompanying illustration is shown a slime decanter, used by the Progreso Mining Company, Triunfo, Baja California, and adapted to the treatment of its low-grade oxidized silver ores, used instead of canvas leaves. A 60-deg. cone is constructed inside of a wooden tank. The inside surface of the cone is constructed of brick and mortar finished with a thin surface of cement. Radial reinforcing walls one foot thick extend from the inside of the cone to the sides of the tank, and the space between these walls and the tank is filled with sand, or jig tailings.

The scrapers are balanced on both sides and are supported by a frame which runs on wheels on a track around the upper edge of the tank, and are steadied by a pin at the bottom. The slimes enter the center and settle on the sides of the cone, whence the coagulated slimes are assisted to the bottom by the slow-moving scrapers without any stirring

*Superintendent, Progreso Mining Company, La Paz, Baja California, Mexico.





Nahl Intermittent Slime Decanter

action. The clear solution overflows at the periphery of the tank. The alkalinity of the solution must be carefully watched to obtain the best results.

The frame carries a foam fence three feet high above the solution, and running down to six or eight inches below the surface. It is made of 1/32-in. steel, and is riveted to the inside of the sprocket band. The foam accumulates in this and dries, and drops in gobs to the bottom when it is too heavy to float. In this way it does not interfere with the clear overflow by being carried over the edge by winds.

The sprocket is a homemade affair. The pins are riveted in a band of ¼ x 3-in. iron. The pins are riveted about a foot apart and set exactly to engage a No. 67 sprocket chain. It is revolved by a 10-in. sprocket. A smaller driving sprocket is actually used than is shown in the diagram and the whole scraping apparatus is revolved by a worm gear at the bottom instead of the bevel gear as shown in the drawing. The chain is guided on the driven and also the driving sprockets by small rollers not shown in the drawing.

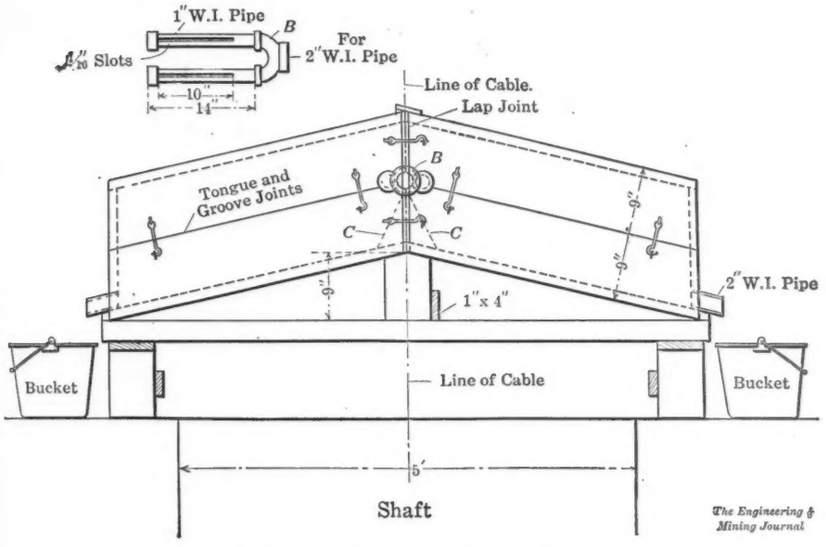
The slimes accumulate and are compressed by their own weight in the bottom discharge pipe, and are discharged intermittently through an appropriate gate at the bottom of the pipe into a car. If it is inconvenient to revolve the scrapers by mechanical power, a small boy can turn them around slowly every two or three hours or so by a crank fastened to the worm shaft.

This decanter was designed by me with the idea of doing away with canvas filter leaves in treating low-grade base silver ores, and also to meet the requirements of out-of-the-way mining camps where other filtering devices might be costly. Possibly some other managers may find this settler effective.

Device for Cleaning Flat Wire Cables

By M. J. McGill*

The accompanying drawing shows an arrangement which I have used successfully for cleaning hardened grease, dirt and rust from flat wire cables. The contrivance consists of a box made in four parts to be hooked and stapled together, in which is fastened a U-shaped steam fitting through which the cable is passed. The bottom of the box is first placed on a platform above the collar of the shaft, the cage or skip being lowered just far enough so as to clear all the cable fastenings. A fitting *B*, made as shown in the drawing, with two 1-in. pipe legs with 1/16-in. slots and capped ends, is placed with one leg on each side of the cable, the slots being turned a trifle downward. The top parts of the box are then placed and hooked to the bottom parts. An opening just large enough to admit the fitting, so as to make it as near grease tight as possible, is made in the side of the box. A steam line is coupled to the fitting *B*, and the steam turned on, while the cage is slowly dropped.



Cleaning Device for Flat Wire Cables

As the cage drops, the cable passes through the steam fitting, and being subjected to the scrubbing action of live steam is readily cleaned. The time required to clean thoroughly depends on the condition of the cable. A few minutes after applying the steam, grease and dirt will begin rolling over the blocks *C C*, which are placed across the inside of the box to strengthen it and to divert grease toward the nipples at the end of the box, from which it falls into buckets placed to receive it. In three hours' time I have thoroughly cleaned 1500 ft. of the worst-looking cable that one can imagine. I have also cleaned some cables of equal length that were not in such bad condition in one-half hour. I have found that this is superior to any hand- or mechanical-cleaning methods that I have seen or read of for thoroughly cleaning flat wire cables. I always lubricate the cleaned cable immediately after cleaning.

*Manager, New York Bonanza Mining Company, Park City, Utah.

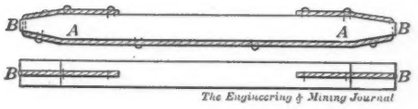
Reinforcing Mine Timbers with Old Wire Rope

By Louis Bourdoire*

In certain mines of Westphalia and Pas de Calais, mine timbers, especially the cap pieces of sets, are reinforced by a piece of old wire rope stretched longitudinally around the timber.

The timbers usually break when the weight of the roof is sufficient to cause a deflection of 20 to 25 cm., but by the time this happens the rope will have stretched and by its tension hold the broken cap to the roof, enabling a miner to catch up and hold the ground before a fall occurs. The ends of the rope are held tightly between the roof and top of the timber so they cannot slip.

The manner of using the rope is shown in the sketch. The ends of the cap are tapered and a groove *B* is cut at each end for the reception of the rope, deep enough to prevent any part extending beyond the end of the timber. Staples should not be driven at the points *A*. In placing the timbers, blocks should not be used, but flat wedges, else the timber may turn when the cap takes weight, and unless the rope is at right angles to the pressure the reinforcing effect will be lost.



Mine Timber Reinforced with Wire Rope

Acid Treatment of Mercury at Florence-Goldfield Mill

It has been found at the Florence-Goldfield mill that it is good practice to distil the quicksilver into dilute sulphuric acid, as the acid attacks any distilled impurities such as zinc and lead which may have gotten into the amalgam. This acid dissolves them and holds them in solution, thus preventing them from contaminating the mercury. Mercury distilled in this manner is more lively than even new quicksilver. The sulphuric acid does not attack the mercury to any appreciable extent.

*Mining engineer, Pas de Calais, France.

Suggested Improvement in Lake Superior Milling Practice

By A. H. Sawyer*

The present practice in feeding steam stamps at the mills in the Lake Superior district, so far as I know, is to allow the ore, as it comes from the mine, to pass through the ore bins and slide slowly down an inclined plane into the feed hopper of the stamp. The rate of feed is controlled by the head feeder, who also picks from the ore lumps of native copper and chips of wood.

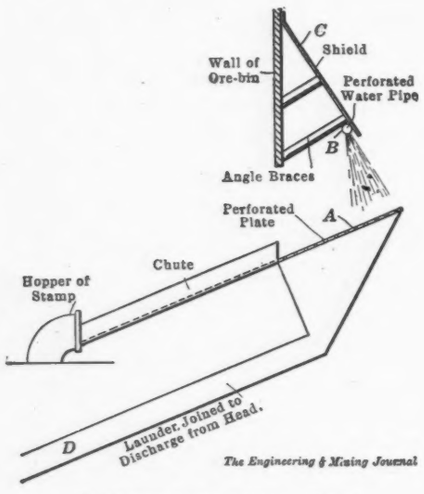
I would suggest the following change in this system, believing that it will increase the capacity of the mills and cost little to install and maintain.

Referring to the sketch, the chute is extended back into the orebin three or four feet. The extended portion *A* is perforated with holes the same size as those in the mortar screen, usually 5/8 in. in diameter for amygdaloid and 5/16 in. in diameter for conglomerate ore. Old mortar screens may be used for this purpose. A water pipe *B* is supported at a convenient hight above the screen and perforated longitudinally so that water may be sprayed upon the ore with considerable force as it descends the chute. The pipe is protected by the shield *C* that extends across the opening in the wall of the orebin. The fine ore, as it comes from the bin, passes through the screen *A*, thence by the launder *D*, around the stamp to join the discharge from the battery. I believe that this method would increase the capacity of the mill by relieving the battery of this material; lessen the cushioning effect of the fine ore; reduce the wear on the stamp shaft and screens caused by the scouring action of this fine ore; diminish sliming, and reduce the expense of milling.

This operation is analogous to the use of a grizzly to take fine rock away from a crusher and is entirely consistent.

An advantage of this method is that the ore is washed clean and is in excellent condition for sorting. As the work of the head feeder is not laborious and his services are required to care for the stamp, he may be employed in picking out waste as well as mass copper and chips of wood. The expense of stamping so much waste would be avoided and that waste would not be enriched at the expense of the ore. In the designing of new mills, I believe space should be allowed here for a picking belt of considerable length.

*Mining engineer, Mandan, Mich.



A Screen for Mill Feed

Determining the Number of Cars Hoisted per Hour

This third chart of the series prepared by L. F. Mitten, of the Vulcan Iron Works, enables the quick calculation of "cars per hour," when depth of shaft and certain other factors are known. As an example, assume the shaft is 475 ft. deep, and a rope speed of 1900 ft. By referring to the accompanying chart, it will be readily seen that from a shaft 475 ft. deep we can get out two cars per minute, or 120 cars per hour. This chart is based on an allowance of one quarter of a minute for changing cars and a double-compartment shaft.

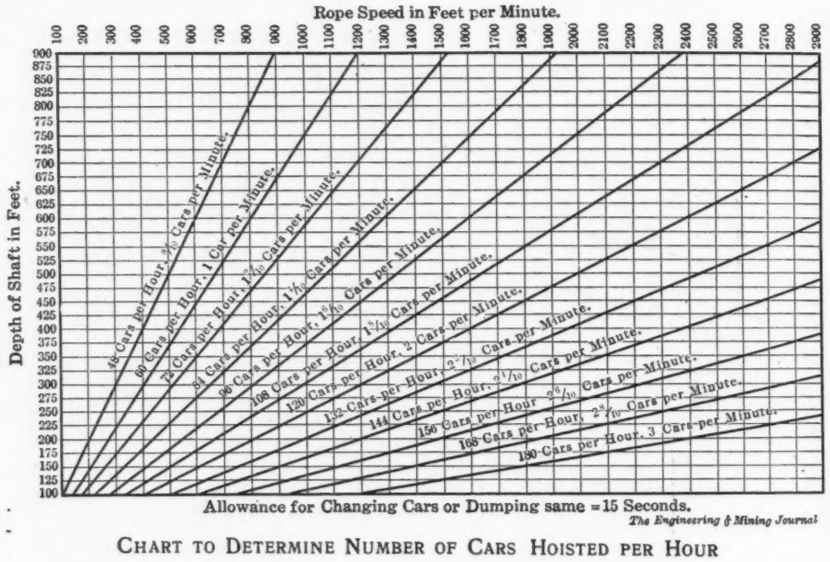

Rope Speed in Feet per Minute.
Depth of Shaft in Feet.
Allowance for Changing Cars or Dumping same = 15 Seconds.
The Engineering & Mining Journal

Chart to Determine Number of Cars Hoisted per Hour

At open-hearth mill No. 2, of the Homestead Steel Works Dec. 9 was cast what is said to be the largest ingot of nickel steel in the world. It is 13 ft. 4 in. high, 10 ft. 8 in. wide, and 4 ft. 4 in. thick, and weighs 135 tons. It will be taken to the press shop of the armor-plate works and pressed into a plate 18 in. thick. The ingot is one of a pair ordered by the United States Government for a fort on the Panama Canal.

Sounds in Gas Engines

A knock in a gas or gasolene engine is often extremely hard to locate, as the same sound can be generated in several ways. According to A. L. Brennan, Jr., (*Power*, Jan. 24, 1911), a loose flywheel is sometimes responsible; yet it may be that the ignition is advanced too far, or there is preignition from incandescent carbon, short-circuits or an overheated engine due to derangement of the cooling system.

Lack of lubrication of using the wrong oil will cause a knock, but it is not such a distinctive sound as something loose or broken. Too rich a mixture or water in the combustion chamber will often cause uneven running which produces a sound that slightly resembles a knock.

Worn bearings will frequently cause an engine to pound in a most alarming way. Care should be taken not to set up a badly worn bearing too much; there is danger of throwing the whole shaft out of line and ruining the remaining bearings.

Sometimes when the compression is not uniform in all the cylinders of a multi-cylinder engine it appears to have a slight knock while in reality it has not; the cylinders with the better compression give stronger power strokes than the weaker ones, and this causes irregular running which is usually attributed to loose parts.

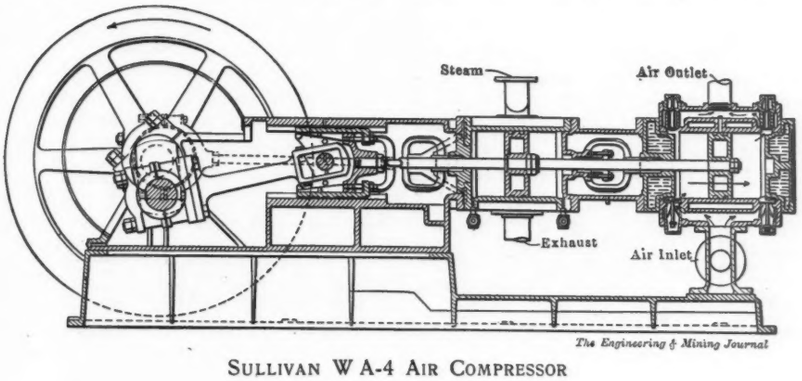
Hissing sounds are mostly due to loose igniters, loose or broken spark plugs, a cracked exhaust pipe, looseness in the exhaust manifold, open compression-relief cocks or worn gaskets.

The correct amount of good oil in the cylinders and bearings and plenty of hard grease or graphite paste in the gears and on other rubbing parts will prevent wear and the resultant noises.

Small Heavy Duty Air Compressors

A new line of small air compressors, classes W A-4 and W G-4, for heavy duty has recently been placed on the market by the Sullivan Machinery Company, of Chicago. The compressors are of small to moderate capacity and for pressures from 10 to 100 lb. per sq.in. They are built with a heavy frame, supporting the bearings and crank shaft at one end and the steam and air cylinders at the other. They are of the center-crank type and a heavy steel guard surrounds the crank, preventing oil being thrown upon the floor.

In the steam-driven machines, the plain steam slide valve is controlled by an eccentric on the shaft, with which it is connected by a simple but satisfactory arrangement of valve rods. The air cylinder is placed outside the steam cylinder, and is connected to it by a heavy distance piece. The air cylinder is supported on a sub-base which runs the entire length of the compressor and maintains proper alinement of all the parts.



SULLIVAN W A-4 AIR COMPRESSOR

In the belt-driven machines, the air cylinder is attached directly to the rear end of the frame.

The air cylinder is cored to form water jackets, and the cylinder heads are jacketed over their whole surface. The valves are placed close to the ends of the cylinder, the inlet valves being at the bottom and the discharge valves at the top of the cylinder. The ports or pockets leading to the valves are short and direct so that practically no air is trapped after compression instead of being expelled from the cylinder. The valves and their parts are so made that in case of breakage it is impossible for the broken pieces to enter the bore of the cylinder. They are held in place in cages that seat, by means of taper fits, in the cylinder walls. To remove the valves it is only necessary to unscrew the plug on the outside of the cylinder; then the entire valve and cage may be withdrawn for inspection or regrinding. The main bearings have adjustable caps and are heavily lined with a good grade of babbitt metal. They are bored at right angles to the center line of the piston rod by a special fixture, which assures accurate alinement. A box-pattern crosshead fitted with adjustable shoes is used; it is of the same type as that employed in cross-compound machines of the highest grade.

The steam machines are governed by a split-ball throttling regulator with an extra cylinder that places the throttle valve under the influence of the air-receiver pressure. The power-driven machines are fitted when desired with an unloading device placed on the air inlet of the compressor. This device is set to shut off the incoming air to the compressor when the receiver pressure exceeds a predetermined point. This enables the compressor to run at regular speed, compressing no air until the receiver pressure again falls below the point set. The device is smooth and even in its action, throwing the load off and on the compressor without sudden jar or strain. In this way reductions in the amount of power used when the compressor is furnishing air intermittently are secured. Machines of similar capacity are furnished for operation by electric or gasolene motor.

The Motter Process

The Colorado Metals Extraction Company, of Denver, Colo., which is exploiting the Motter process, has secured the Lowell mill, at Idaho Springs, Colo., under a long-time lease, and will make therein an installation of the Motter process.

According to the Motter process, mixed sulphide ores are crushed dry and roasted lightly in a special furnace, with the object of sulphating the sulphides. Acid is recovered as a by-product. The roasted ore is leached for the extraction of sulphates of silver, copper and iron, which are recovered respectively as silver chloride, metallic copper and iron sulphate.

The residue from the lixiviation is reground and run over an amalgamator for recovery of the gold. The tailings from the amalgamator are concentrated on tables for recovery of the lead and zinc minerals, and from that concentrate iron is extracted by means of a magnetic separator.

Explosion at Keating Mine

SPECIAL CORRESPONDENCE

Shortly after 2 p.m. on Jan. 18, an explosion occurred in the No. 2 shaft of the Keating Gold Mining Company, at Radersburg, Mont., causing the death of six men, three from the direct effect of the shock, and three by asphyxiation in the fumes from the gelatin. Two men were injured, but escaped with their lives, as by a miracle.

CAUSE NOT LIKELY TO BE DISCOVERED

The direct cause of the explosion will probably never be known. During the forenoon of the same day, the skip used in hoisting ore either jumped the track or the bearings broke so that the skip was drawn to the surface loaded, dragging on the track, minus wheels and axles, bending the rope rollers and doing other damage to the track. At the time of the explosion five men were engaged in the shaft making repairs, straightening and resetting the rollers at a point 60 to 80 ft. above the 200-ft. level, where the skip was standing, having just been lowered from the surface with tools for the upper group of three men who started to work on a roller above the skip. The other two were working just below the skip. A hammer had just been handed to the shift boss who struck a blow on the roller when the explosion occurred. His assistant was on the bail of the skip and fell back into the skip on the other man who was about to climb out. This saved the lives of these two men, for the falling of the timbers caught the bell rope, signaling one bell at the hoist room and the men made unconscious by the fumes were drawn to the surface.

The three men who were suffocated were at work below on the 300 level; one, the powder man at his bench preparing the charges for the shift and the other two at the north face of the level, 750 ft. from the shaft. Through their attempt to cross to the south of the shaft and thence by connecting levels to the Keating No. 1 vertical shaft, they were caught just south of the shaft in the fumes, drawn or forced down through the stopes and returning to the incline, which is the upcast for the mine. One of these men was picked up about 40 ft. and the other two 25 to 30 ft. south of the shaft. Had these men remained where they were or taken the upcast stopes to the lower level and thence across, they would have escaped the fumes and would have been rescued with the miners who were at work on the 400, 500 and 600 levels.

EVIDENCE OF TWO SHOCKS

William Walsh, State mine inspector, examined the mine the day following the accident, and later Hugh M. Wolflin, of the mine rescue car stationed at Bridger,

and L. S. Ropes, mining engineer, of Helena, inspected the workings in the vicinity of the explosion. There appear to have been two shocks from the evidence brought out, one more severe than the other. It is thought that the heavier one, judging from the effects, was at the station on the 200 level, and the minor one the powder thawer, which was placed about 90 ft. south of the station on the same level, beyond which the ore had been stoped out both above and below, to the surface and to the 300 level.

At the station, all timbering was wrecked for six sets above and four below, or 35 and 25 ft. either way. Powder that has been brought down after the noon hour was scattered unexploded for upward of 100 ft. north on the 200 level. It is supposed that the powder man had placed his powder at the station ready for the afternoon work, and that some still remained in the thawer, which was heated by electric lamps in the lower compartment. No vestige of the thawer has been found on the level, and if any remained after the explosion, it is buried in the débris from the stopes south, where the stulls and lagging were blown out and the filling discharged to the level and into the lower stopes over the 300 level.

Headframe Not Injured

The effect of the explosion is noticeable at several surface openings, but no damage was done the headframe nor was the heavy skip thrown from the track in the shaft. The formation is exceedingly hard and strong and does not weather on exposure, so that the wrecking is entirely in the timbering. Work of clearing the shaft and retimbering was not commenced until noon, Jan. 22, when three shifts were put on. Arrangements will be made temporarily for hoisting the ore through the vertical No. 1 shaft, the repairs requiring about two weeks to complete.

The accident is of an unusual nature and following the accident to the skip in the forenoon, brought the five men in the shaft, within its range, otherwise the accident might not have occurred, or had it occurred, no one would have been in the shaft, and it is probable that the men on the 300 level would have remained where they were safe, but knowing the others were in the shaft, it is presumed they made the desperate attempt to get to their assistance.

Journal Index

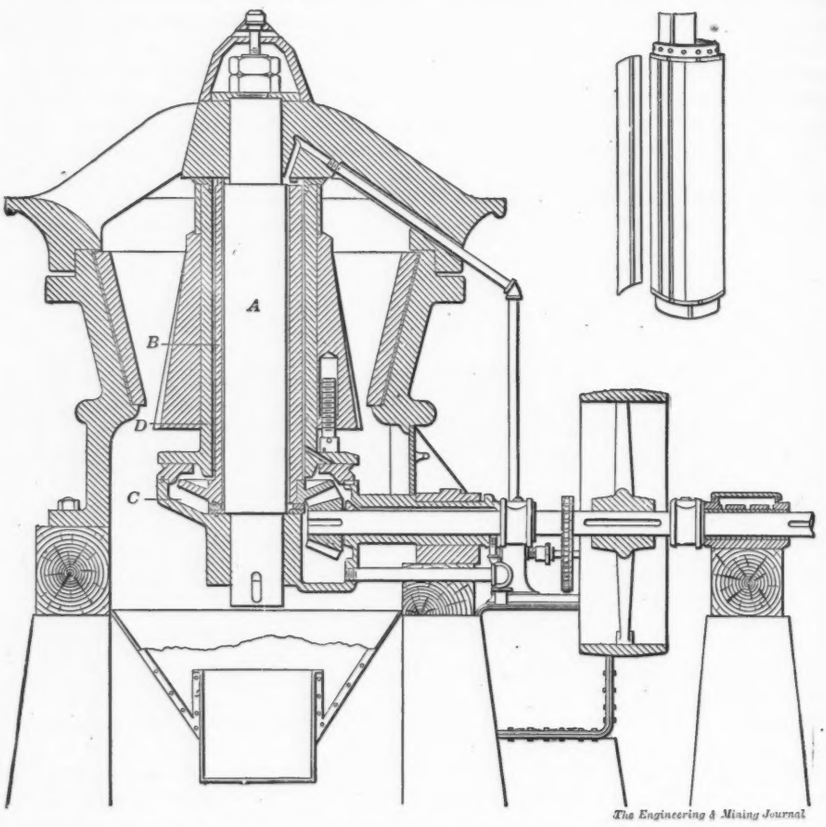
The index to Vol. 90 of the Engineering and Mining Journal is mailed with this issue (Feb. 11, 1911). Any subscriber who does not receive his copy should notify the Journal office to that effect.

The Symons Crusher

In the usual types of gyratory crusher, motion is imparted to the crushing head by the central vertical driving shaft. The lower end of the shaft is held by an eccentric box offset one-half inch from the axis of the shaft. To rebabbitt the eccentric box, it must be removed, which is accomplished by dropping the bottom cover of the eccentric box chamber and removing the eccentric box from below. This necessitates building the foundation so as to leave working room beneath the crusher.

In the Symons crusher the eccentric driving shaft *B* is hollow and fits like a sleeve over the central fixed pillar *A*. Over the hollow driving shaft and attached to the crushing head is a casing *D* which is flanged at the bottom below the crushing head, which flange covers the casing of the bevel wheel *C*, keeping dust from entering the bevel-wheel chamber.

To babbitt the eccentric, it is lifted out at the top. The babbitt is supplied by the manufacturers, cast in staves or sections extending the length of the eccentric, as shown in the insert of the accompanying illustration. From each stave projects a babbitt keyway, cut in the eccentric, thus holding the stave securely in place. Together, these staves form smooth, continuous bearings. When worn any stave may be separately lifted out and replaced by a new one from stock.



Sectional Elevation of the Symons Fixed Pillar Crusher

The Potash Salts Question

Washington Correspondence.

An answer to American representations on the potash question has been filled by the German government with the State Department. This answer is practically a rejection of all of the American demands, according to information now available, and would leave American holders of the much contested potash contracts practically no recourse except to the German courts of justice. With reference to our general claim that the potash policy of Germany is unjust, it is answered that this policy is a measure of conservation analogous in nature to the conservation policy that is advocated for use in this country. The over-production tax, which we have complained of on the ground that it falls unfairly on American holders of potash contracts is described as being simply a feature of German internal legislation and hence not subject to criticism from the outside world. Moreover, it is alleged that this tax is paid by the German mine-owner and not by the foreigner. It is true that in particular contracts the foreign (American) holders agreed to liquidate all governmental charges and dues of every description but it is considered an open question whether the present extraordinary tax would be included under the general descriptive term which has been

employed for indicating the governmental charges that were to be payable by the American holders. As to the exact legal responsibility for the tax under these contracts, it is considered that this is a matter which can be settled only through reference to the proper courts which, according to the German point of view, are those of the German Empire.

The potash situation is thus brought to a deadlock and the adminstration is once more facing the question whether it will apply the maximum rates of the Payne-Aldrich Tariff Law to imports from Germany in order to compel the recognition of the American potash contracts without subjecting them to the excess production tax. Opinion has grown considerably stronger in opposition to the use of the maximum rates in this way because of the increasing doubt whether the German policy as to potash does actually constitute a discrimination against the United States in the sense in which that term was employed in the tariff law. Discussion of the situation on the floor of Congress is now threatened and, at the request of certain members, the Bureau of Corporations has prepared a report on the status of the fertilizing industry in the United States designed to show how far the industry has already been subjected to monoplistic control.

Bill to Open Alaska Coal Lands

WASHINGTON CORRESPONDENCE

Senator Knute Nelson, of Minnesota, has reported from the Senate committee on public lands the bill (S. 9955) which was introduced by him some time ago for the purpose of providing a method for the leasing of coal lands in Alaska. In summing up, Mr. Nelson says:

No locations or entries of coal land have been made under the law of 1908, and all coal lands in Alaska are still withdrawn from location, filing and entry, so that not a single coal mine can be opened, developed or utilized in Alaska, and all coal used in that Territory, aside from a little lignite secured at a few points for local consumption, is still imported from the outside, and most of it from foreign countries. This situation is intolerable, and it seems to your committee that legislation to permit the opening and development of these coal lands is urgently needed, and for this reason your committee recommends the passage of this bill. The aim of the bill is not so much to secure large royalties for the Government as to promote the speedy opening and development of the coal lands and the furnishing of the coal to the consumers at fair and reasonable prices; and in order to protect the consumer and to prevent a monopoly the bill provides, among other things, that the Interstate Commerce Commission shall have jurisdiction, as in the case of railroad rates, to prescribe the just and reasonable prices at which the coal shall be sold, and the just and reasonable rates at which the same shall be transported. The bill provides for an exploration license covering 2560 acres and authorizes the leasing of a similar area in a single lease at a reasonable royalty and rental for a period of 30 years with privilege of renewal for 10 additional years.

A few changes of detail are made in the bill but the measure is otherwise as it was when it was first introduced, at which time it was reviewed in this correspondence.

Report of De Beers Consolidated

The report of the De Beers company for the year ended June 30, 1910, shows a great improvement in the demand for stones. More blue ground was washed than hauled, the excess being 1,572,632 loads. The diamond account credited to profit and loss shows a rise for the year of £2,339,983, which is attributable to the increased production and sales and the realization of diamond stocks on hand at the commmencement of the year. Since the close of the financial year a new diamond contract more favorable to the company has been concluded with the Diamond Syndicate.

YIELD FROM BLUE GROUND TREATED.

	Carats per Load.	Value per Carat.	Value per Load.
De Beers and Kimberley	0.38	47s. 9.24d.	18s. 1.83d.
Wesselton	0.32	34s. 3.58d.	10s. 11.7 d.
Bulfontein	0.37	32s. 1.63d.	11s. 10.68d.
Dutoitspan	0.23	68s. 1.46d.	15s. 8.02d.

The chairman states that production is being restricted and hauling is done only on the day shift. The De Beers diamonds are of a better class and greater value than those produced by competing companies, 80 per cent. of the product being of the better class, worth 40s. or $10 per carat.

RECORD OF BLUE GROUND MINED AND WASHED.

	Loads Mined.	Loads Washed.
Kimberley	431,339	1,808,734
Wesselton	1,702,237	2,139,738
Bulfontein	2,099,173	1,818,509
Dutoitspan	878,775	917,175
Total	5,111,524	6,684,156

The De Beers and Kimberley mines are over 2000 feet deep and have immense low-grade ground requiring careful management in order to obtain a profit. There is a reserve of 7,700,000 loads of blue ground weathering on the floors of the various mines. During 1909 the De Beers could sell scarcely any stones of any kind and the syndicate that controls the selling accumulated a stock worth £1,200,000; this, with £5,800,000 worth of ordinary product, was sold during 1910.

It is stated as almost certain that a working agreement will be concluded between the De Beers and the German Southwest Africa syndicate. The stones produced by the German syndicate are mostly small, but in 1909 these fields, where the diamonds are picked from wind-blown desert sand, produced 468,930 carats of £795,000 value.

The Canadian Mining Institute

The thirteenth annual general meeting of the Institute will be held in the city of Quebec, March 1 to 3. The headquarters will be at the Chateau Frontenac. Some important matters will come up for discussion at this meeting, including the proposed new mining law of the Dominion.

The provisional program of papers is as follows: "The Iron Ore Resources of the World," by Dr. F. D. Adams; "Notes on the Iron Ores of the Metagami River," by M. B. Baker; "Recent Developments of the Bathurst Iron Mines," by J. E. Hardman; "The Undeveloped Iron Resources of Canada," by A. B. Willmott; "The Undeveloped Coal Resources of Canada," by D. B. Dowling; "The Company Law in Canada," by G. G. S. Lindsey; "The Mining Law of Ontario," by S. Price; "The Functions of Provincial Bureaus of Mines," by P. Williams; "The Economic Geology of the Chibougamou District," by Dr. A. E. Barlow; "The Asbestos Deposits of the Western United States," by D. J. Diller; "Asbestos Deposits of the New England States," by Prof. C. H. Richardson; "The Milling of Asbestos," by Edward Torrey; "The Clays of Western Canada," by Dr. H. Ries; "The Origin of Archean Graphite," by H. P. H. Brumell; "The Ore Deposits of the Atlin District, B. C.," by D. D. Cairnes; "Copper Mining on the British Columbia Coast," by William M. Brewer; "The Copper Deposits of the Keeweenaw Peninsula, Compared with Similar Canadian Deposits," by Dr. C. Alfred Lane; "The Geology of Petroleum," by Eugene Coste; "The Western Ontario Gold Deposits," by F. Hille; "The Markets for Canadian Ores and Minerals, and the Need for Better Freight Rates and Shipping Facilities, in Order that Full Advantage may be taken of these Markets by Canadian Producers," by J. J. Harpell; "Photography for Mining Engineers and Geologists," by H. Mortimer Lamb. Several other papers are expected.

Correction

In the article on "The Use of Oil in Smelting," in the JOURNAL of Jan. 28, 1911, E. H. Hamilton writes us that there is an error in the statement which reads: "One barrel, of 42 gal., of California oil was about equal to one ton of best bituminous coal." This should read: "Three and four-fifths barrels of 42 gal. each were about equal to one ton of best bituminous coal."

Air Currents and Shaft Plumb Lines

By George C. McFarlane*

The deflection of plumb lines in shafts is practically the same in up- or downcast currents, and proportional to air velocity. Shafts may be plumbed by direct sighting.

A number of years ago it was found that two 4000-ft. plumb lines suspended in one of the Calumet shafts were one-tenth of a foot farther apart at the bottom than at the collar of the shaft. Prof. F. W. McNair, of the Michigan College of Mines investigated this apparent paradox and concluded that this divergence was caused by air currents in the shaft.

Effect of Air Currents

Prior to this time it was considered that a plumb line suspended in a shaft defined a vertical. Although plumb lines vibrate irregularly, the average of a number of vibrations should be vertical. It was also well known that air currents in the shaft greatly increased the amplitude of the vibrations and in a shaft where there was no circulation of air the corner plumb lines scarcely vibrated at all when let down. I have never succeeded in getting the meridian as obtained from two plumb lines in a shaft to check with the meridian obtained from direct sighting and by traversing between two shafts except in two instances.

Effect of Plumb-line Deflection at the Leyden Mine

Recent experience has convinced me that air currents cause perceptible deflections of plumb lines in shafts of moderate depth; this deflection is independent of the direction of the air current, as an ascending current throws a line in the same direction as a descending current. The amount of the deflection is nearly proportional to the velocity of the air in the shaft.

About a year ago a resurvey was made of the Leyden mine, the underground meridian being obtained by two sets of underground traverses between the shafts. The plumb lines in the shafts were also triangulated from stations on both sides of each shaft. In checking over the field notes of this survey, I found the meridian given by the triangulations on the shaft wires varied from 14 to 18 minutes with the meridian established by traversing. As the four variations noted were all in the same direction, and as the field engineer was an exceptionally careful and accurate observer, I concluded there must have been a definite reason for these discrepancies. Fig. 1 shows the position of the lines in the upcast and downcast shafts. As the fan was slowed down to about 25 r.p.m. there must have been a current of about 250 ft. per minute in the shafts.

Determination of Deflection

To determine what effect the air current might have had on the lines, I recently suspended one of the 10-lb. brass bobs with a No. 28 steel wire in the 700-ft. upcast shaft in the position *P*, Fig. 2. Two transits were placed as shown and scales fastened behind the lines at right angles to the line of sight

*503 Gas and Electric building, Denver, Colo.

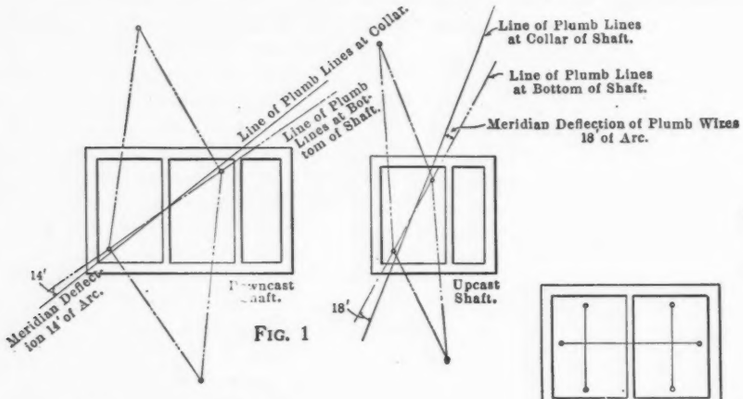

Line of Plumb Lines at Collar.
Line of Plumb Lines at Bottom of Shaft.
14'
Meridian Deflection 14' of Arc.
Downcast Shaft.
Upcast Shaft.
18'
Line of Plumb Lines at Collar of Shaft.
Line of Plumb Lines at Bottom of Shaft.
Meridian Deflection of Plumb Wires 18' of Arc.

FIG. 1

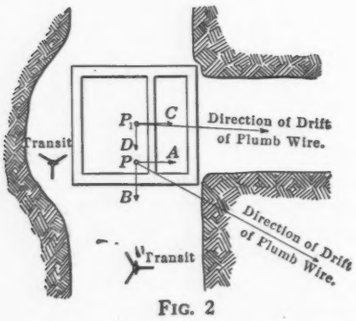


FIG. 2

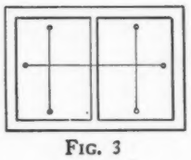


FIG. 3

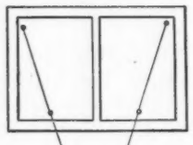


FIG. 4

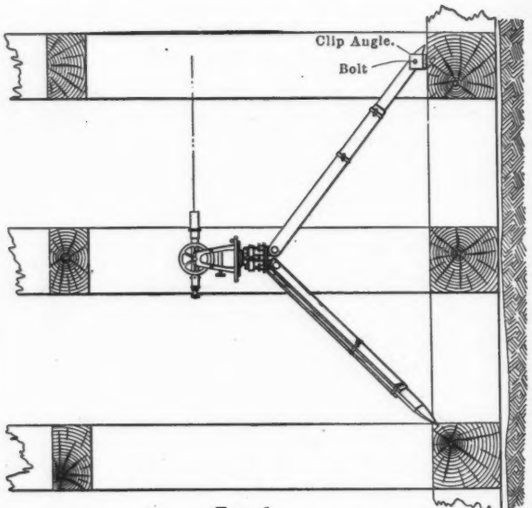


FIG. 5

DIAGRAMS ILLUSTRATING SHAFT PLUMBING METHODS

The first readings were taken with the air in the shaft nearly quiescent, the fan being stopped and all doors leading to the shaft closed. The anemometer showed no movement although the smoke from the lamps showed a slight draft toward the shaft, indicating a possible up current of 15 to 20 ft. per min. With the plumb bob immersed in a bucket of oil and water, the line quickly settled to a vibration with an amplitude of 3/8 in. The greatest variation between the mean of any of the vibrations was 3/32 in.; the mean of all the vibrations was assumed to be prime vertical.

The fan was now started at a moderate speed. Anemometer readings in

the entries leading to the foot of the shaft showed an average up current of 830 ft. per min. The amplitude of vibration was now about two inches, the maximum variation between the mean of any two vibrations was 29/32 in., and the maximum variation between any set of six vibrations was 19/64 in. The average deflection shown by 36 readings from the prime vertical established by the plumb line in the first case was 1 26/64 in. in the direction *A* and 59/64 in. in the direction *B*. The fan was now reversed and run at a speed that gave a descending current of 505 ft. per minute; the amplitude of vibration now averaged 15/16 in. The greatest variation between the mean of any two vibrations was 5/64 in. The average deflection from the prime vertical was 35/64 in. in the direction *A* and 17/64 in. in the direction *B*.

The plumb line was now placed in the position *P*, and with an ascending current of 740 ft. per minute the deflection was 1 7/16 in. in the direction *C* and 5/64 in. in the direction *D*.

Plumb Lines Inaccurate in Air Currents of Over 100 Ft. per Second

The result of these experiments shows that plumb lines are inaccurate when the velocity of the air current in the shaft is over 100 ft. per sec. and that the deflection from the vertical is always toward the wall of the shaft and is practically proportional to the velocity of the air current. When hung in a corner of the shaft the greatest deflection is toward the long side. When two lines are placed on opposite sides or in opposite corners as shown in Fig. 3, the direction of a line joining them is not materially affected by the deflection. If the lines are placed in diagonally opposite corners or in positions like that shown in Fig. 1 and Fig. 4, the direction of the line joining them will be materially affected and the meridian determination rendered useless if there is much air current in the shaft. The walls of the shaft in which the above experiments were tried were fairly smooth, as walls and partitions were solid timber from top to bottom; the shaft was also entirely free of dripping water.

Cause of Deflection

The explanation for the deflections of plumb lines outward toward the walls of the shaft is that the central body of the current expands as the outer perimeter of the air column is retarded by the friction of the walls. The same result can be noted in any swift stream of water. If a log is started in the center of the stream it will eventually be swept to the shore. The powerful undertow in rapids and swift water also shows that the flow lines of any fluid are directed at a more or less acute angle toward the wetted perimeter.

Shaft Plumbing by Direct Sighting

I recently tried a direct-sighting method that I found to be accurate and convenient for carrying the surface meridian down a vertical shaft. So far as I know, this particular method has not been tried before. It depends on the fact that in an inclined plane, lines joining points of equal elevation have the same azimuth. An ordinary transit or a wye-level on an extension tripod can be used. For deep shafts a wye-level, owing to its more powerful telescope, would be best.

To carry out the method two nails or spads are lined in on the sheave timbers over the shaft, or in blocks projecting over the collar of the shaft. The transit or wye-level is set up on the wall of the shaft as shown in Fig. 5. A clip angle is screwed fast to a shaft timber, and a small hole is drilled through the shoe of one of the legs. This leg is extended and bolted to the clip angle and the other two legs are shortened and set on a timber lower down. In this position the axis of the instrument is approximately horizontal. If a transit is used the vertical circle will be set at zero so the telescope axis will be at right angles to the instrument axis.

The instrument is now swung with the leveling screws until the plane of rotation of the telescope axis intersects the two points set at the top of the shaft. If the shaft is not over 600 or 700 ft. deep the instrument may be set at the bottom of the shaft, as looking from the dark shaft into the bright light of day gives such excellent definition that fine sights can be taken even at a distance of 700 ft. The telescope is now swung around so as to point into the drift or level and two points of nearly equal elevation sighted. These points will have the same azimuth as the points established at the surface.

Plumbing Deep Shafts by Direct Sight

In case the shaft is too deep to be sighted at one operation, the points may be brought down in stages, the instrument being operated from the cage. The hood being raised, the instrument set up on the wall of the shaft and swung into exact alinement with the points above, substations are sighted in a few feet above the cage hood, the second point being leveled from the first one with a straight-edge and a carpenter's level. These substation spuds are now illumined and a white block for a background placed back of each spud. The signal to lower is now given to the top watch, the engineer lowers the cage about six inches, pauses two minutes, then lowers 250 ft. to the next set of substations.

The advantage of this method of direct sighting is that the instrument man can quickly throw the plane of rotation of the telescope into exact alinement with the points above. On the other hand, when a transitman is setting points far down a shaft it requires a lot of time and signaling back and forth to get the helper to drive the nails in places where they can be seen from above.

Plumbing Inclined Shafts

It will be understood that this method only gives the direction of the meridian underground and it will be necessary to drop one plumb line from the surface to properly coördinate the surface and underground surveys. However, in case of a highly inclined shaft that can not be plumbed, if it can be lined up with one sight, the angle of the line of sight may be read on the plates from two horizontal points previously established in the drift or level. The dip of the plane of rotation of the line of sight may be determined by intersecting a short plumb line in the drift and measuring the interscetion angle. As most shafts are fairly straight the plane of rotation of the line of sight will be nearly vertical in most cases, perhaps not varying more than six inches in several hundred feet.

A Triboluminescent Compound

Triboluminescence is the title given to that property which causes a substance to emit light on being scratched or rubbed. A strongly triboluminescent compound is described by W. S. Andrews.[1] This consists of zinc carbonate (chemically pure), 70 parts; flour sulphur, 30 parts; manganese sulphate, trace. Mix the zinc carbonate as a fine powder with the sulphur, then dissolve a small piece of manganese sulphate in distilled water and add enough of the solution to the powdered materials to make a thick cream. Thoroughly triturate in a mortar, then pour into a shallow glass or earthenware dish, and dry at a moderate heat. When dry reduce to fine powder, pack hard into a porcelain or fire-clay crucible with a tight cover, and subject to a bright red heat for 20 minutes. The mixture shrinks into a stone-like mass, which emits a train of yellow sparks when scratched.

The sparks will not set fire to inflammable gases and hence is not a substitute for flint and steel, or the cerium-iron lighters now on the market.

It is a possibility that the triboluminescent zinc ores sometimes found closely approximate the artificial compound described above. It is well known to mining men that certain specimens from the Merced River district in California, and from Saltillo, Mexico, become strongly luminescent on being scratched in any way.

[1]Chicago meeting, American Electrochemical Society, 1910.

Notes on the Rand Gold Mines

By Robert Peele *

The future of the Rand mines depends upon profitably working the low-grade ore from the deep levels. Larger equipments and stage hoisting being used.

*Profesor of mining, Columbia University, New York, N. Y.

During a recent visit to the Transvaal, I was given opportunity to see a number of the Rand gold mines, and venture to present a few desultory notes on the methods there employed. Since much has been written on the geology and ore deposits of the Witwatersrand, a brief statement respecting the veins themselves will suffice to bring the local conditions before the mind of the reader.

Of the three principal groups of veins or "reefs" only the "Main Reef series" has thus far proved to be of economic importance. All of the larger mines are on the interbedded vein of this series. In the earlier days some work was done on the veins of the Kimberley or "Battery-reef series," but their average value appeared to be too low for profitable exploration at that time.

The Main Reef Series

In the central portion of the Rand, the Main Reef series comprises three important veins. On the footwall side is the main reef, averaging 6 to 7½ ft. in width, widening sometimes to 30 or 40 ft., but in the widest parts is usually too low grade to be mined. In general, it must be worked economically and on a large scale to yield a profit. Lying close above this vein is the "Main Reef Leader," averaging 18 in. in width. It is often split by bands of quartzite, containing scattered pebbles, but is much richer, as a rule than the main reef and is profitably worked in all the mines. Under it is the so called "interbedded dike"; which is not, however, a true dike, as it is composed of fine-grained quartzite. The third and most southerly vein of the series is the South Reef, lying usually from 35 to 80 ft. above the Main Reef leader. It averages from 8 to 12 in. in width, throughout the central part of the district, but pinches out or becomes poor toward both the east and west; on the whole, it is the richest vein now being worked on the Rand. Both the Main Reef leader and the South Reef frequently pinch to only a few inches in width, though in such places the grade of the ore is above average. While the general character and position of the veins are substantially as described above, there are many local variations. They are often faulted and, instead of maintaining their normal distances apart, may approach one another quite closely; in places they are worked almost as a single vein. Broadly speaking, the horizon of the main-reef series, from the footwall of the lowermost to the hanging-wall of the uppermost vein, has a width of 60 to 90 feet.

The conglomerates of which the reefs are composed consist chiefly of rounded pebbles, from one-quarter to one inch in diameter; sizes larger than 1½ inches are rarely seen. Most of the pebbles are quartz, though some are of other rocks, such as slate. The matrix is a secondary deposit of silica accompanied by disseminated pyrites with which the gold is generally associated. Gold is not found in the pebbles. It is a generally accepted hypothesis that the pebbles were originally sea-beach deposits, subjected subsequently to upheavals, and that the gold has been precipitated from percolating waters, which also carried the silica that formed the matrix. The shingle beds thus became veins of solid conglomerate. On the whole, the reefs are richest near the outcrops, where the gold sometimes amounts to several ounces per ton.

A marked impoverishment has taken place in depth, a condition which has stimulated continued efforts toward greater economy in operating expenses. The result is that a number of the deeper mines are now successfully working ore worth from $5 to $6 per ton; excellent work, for example, is being done at the Simmer Deep and the Knights Deep, in mining low-grade ore. At the former, on a production of 30,000 to 40,000 tons per month (from the Clement and Milner shafts), the total mining cost, not including milling nor general expenses, ranges from about $1.85 to $2.15 per ton of ore broken. At present, ore worth $4 per ton can be profitably mined and milled in most of the properties on the Rand, though this depends also on the thickness of the reefs and the scale of operations. At the Robinson mine (an outcop property), where conditions are usually favorable as to quantity and value of ore, the total cost, including milling, has sometimes been as low as $3 per ton.

Persistence of the Reefs in Depth and Length

There are now on the Rand about sixty producing mines, with about 9500 stamps and 150 tube mills. Over one-half of these properties (38 to 40) paid dividends in 1910. The principal mines in active operation extend from Randfontein, 30 miles west, to the Modderfontein property 25 miles east of Johannesburg; a total distance of about 55 miles, measured along the outcrop. In this length (which does not, however, comprise the extreme known limits of the ore), there is but one area—the Witpoortje break of 4½ to 5 miles—where the reefs are poor and irregular. With a single possible exception—the copper-bearing series of Keweenaw point and Ontonagon county, Mich.—such persistence of the same veins is unequaled in the known mineral districts of the world. The dip of the formation and the veins is extremely variable, averaging about 30 to 35 deg.; it is always steeper near the outcrop, and occasionally is almost vertical. The dips are steepest in the westerly, or Randfontein section, where the average is over 60 deg. In depth, the veins tend to flatten and in some of the deep-level mines, dips of 20 to 25 deg. or less are common. Sometimes toward the east the veins become nearly horizontal with local undulations (as in the Simmer & Jack mine), even producing reversed dips.

The Deep and Deeper-deep Mines

Adjoining the older or outcrop mines on the south is the first row of deep-level mines, extending in a nearly continuous east and west line for many miles. Beyond these, on the hanging-wall side, large areas have been acquired by mining companies and a second row of deep-level shafts (the "deeper deeps") has been begun, designed to intersect the reefs at vertical depths of 4000 to 4500 ft. Throughout a large part of these areas the reefs lie at depths of 5000 to 6000 ft. A number of the "deeper deeps" have reached the producing stage, but much of the ore encountered is low grade and more work must be done before definite statements can be made as to the ultimate economic value of these properties.

The Cost of Deep Shafts

The cost of the deep shafts is great. If in relatively dry formation, a five-compartment shaft, 1000 ft. deep, will cost on an average $120 per foot, and to this must be added about $250,000 for hoisting engines, boilers, headgear and other surface plant. When pumping is necessary, the cost may be considerably increased. To sink and equip a 4000-ft. five-compartment shaft the cost will probably range between $800,000 and $1,000,000, including $125,000 to $150,000 for pumps and the additional boiler plant required. It must be remembered, however, that unless a partnership connection can be made with some adjacent mine, the government regulations on the Rand require that two shafts must be

sunk before mining can be begun, so that cost of shaft and equipment only, for a deep-level property may vary from $1,600,000 to $2,000,000. Under normal conditions to sink a 4000-ft. shaft requires about four years.

Double-stage Hoisting Succeeding Single-stage Hoisting

After intersecting the reefs most of the deep-level shafts are turned to follow the dip in the footwall generally after being sunk below the ore. It has generally been the practice to hoist direct from the bottom to the surface; the skips being designed to pass around a long-radius curve, connecting the inclined with the vertical portion of the shaft. This has its disadvantages; the hoisting speed must be reduced in rounding the curve and wear and tear on rope, skip and guides is increased. These considerations, together with others related to the problems of hoisting from great depths and raising and lowering men, have elicited much discussion during the last few years, the most notable contribution to which is the well known work of H. C. Behr, consulting mechanical engineer to the Consolidated Gold Fields.

Opinion now tends toward the abolishment of continuous hoisting throughout the entire depth of "turned-vertical" shafts and, instead, to hoist in two stages. At one of the Simmer Deep shafts the skips are hoisted in the inclined portion by a compressed-air winding engine, erected near the intersection, and are dumped into pockets at the foot of the vertical shaft, where the ore is loaded into skips going to the surface. Plants for other mines are now being designed or installed, for hoisting the lower stage by electrically driven drums.

The Handling of Ore Underground

In many of the mines, whether outcrop or deep-level, tramming to the shaft is not done in all of the levels but is concentrated on every second or third level. The ore from the stopes of the intermediate drifts is shot down through raises (locally called "boxes") to pockets on the main or tramming levels, where it is again loaded into cars for transport to the shaft. The efficiency of underground transportation is thus promoted as the trammers are kept more steadily employed and can be better supervised. Another method is to drive the levels farther apart than the customary 100 ft., thus increasing the quantity of ore exposed per foot of development. This policy is advantageous for veins of fairly steep dip, but, for flat dips more manual labor is required in the stopes for handling and loading. When the dip of the reefs is too flat for the ore to fall unaided into the "box holes" or mills, 300 ft. measured on the dip is considered the maximum distance between levels. While hand tramming is the rule in the Rand mines, there are some exceptions; as at the Langlaagte Deep, where a monorail system of suspended trucks is in use. In the near future electric haulage will be employed in a number of mines. For this and other purposes large central stations are now being installed for compressed air and electric transmission of power.

The combination of relatively narrow reefs and rather flat, variable dip, makes necessary considerable rehandling of ore. These conditions have led to the introduction of various labor-saving devices in the stopes. Small "aërial" rope-ways running down the dip, have been tried; but the simple and economical shaking chutes are now quite commonly used. They are long, shallow, sheet-iron troughs, of curved cross section hung by short chains from eyebolts set in holes in the hanging-wall. The chute is suspended in an inclined position, and the broken ore shoveled into it while it is being swung longitudinally by a "boy." By its inertia, at each backward swing the ore moves down the chute from a few inches to a foot or so, and is discharged almost continuously from the lower end. In a large but narrow, flat stope, ore may thus be conveyed considerable distances by arranging two or more chutes in series, the first discharging into the second and so on; if required to reach a given point, the different lengths or sections may be placed at angles to one another. These inexpensive contrivances have a large capacity with a low operating cost.

Native Labor

The Kafir and other native labor employed in the Rand mines is well suited for doing the hand drilling necessary in narrow veins of flat dip. At many mines, the width of the stopes, in narrow portions of the South Reef and Main Reef Leader, is properly kept down so far as possible, to the minimum (18 to 22 in.) in which a "boy" can wield a hammer, when lying on his side or back. Such work is disagreeable and exhausting and it is quite certain that white men could not be induced to do it. Where the stopes average 4 ft. 6 in. and more machine drills are usually employed, but the greater part of the stoping throughout the Rand is done by single-hand drilling. Hammer drills have recently been satisfactorily introduced at some of the mines. In most cases stoping, as well as development work, is done by white contractors, who oversee and are responsible for the work of hand- or machine drilling done by the "boys."

Supporting Empty Stopes

A remarkable feature of the Rand veins is the soundness and strength of the hanging-wall. Even in the flattest portion, the roof stands well, unsupported over large areas. Sometimes pillars are left (especially in poor spots) or pillars are built of waste. Little timber is required anywhere in the stopes, a fortunate circumstance, in view of the high price of timber in the district. A few props are occasionally put in near the stope faces, in places where the roof is shelly or otherwise locally insecure, to protect the miners and to assist in detecting movement of the hanging-wall.

Sand Filling of Empty Stopes

Recently, at the Robinson, Ferreira Deep and several other mines, sand filling has been introduced with the twofold object of supporting the hanging in stopes where the ore is taken out completely over large areas of reef, and to dispose cheaply of the sands from the cyanide plants. At present, where this practice has been begun, the sands from the tailings dumps are run into the stopes through iron pipes and wooden launders with from 6 to 10 per cent. of water; but preparations are being made for discharging the sand vats direct through pipes, without the necessity of any surface handling. For receiving the filling underground, wooden bulkheads are built longitudinally along the lower side of the stopes, just above the level. These bulkheads are made of stulls to which horizontal planks or boards are spiked. To render them tight the joints in the planking are calked with hay or oakum. The bulkhead must be carefully fitted to both foot- and hanging-walls, to prevent leaks, which are liable to occur and difficult to deal with. Sand filling furnishes a perfect support for the hanging-wall and it will probably be largely adopted in the future. Moreover, some mines in the older parts of the district are already embarrased for tailings space, and the disposal of the material on the enormously high dumps has become increasingly expensive. Tailings are usually conveyed up the steep slopes of the dumps by overhead endless-rope haulage, which requires the constant attendance of a gang of men.

The City Deep Mill

The stamps used in the Rand mills are of the California type, varying from 850 to 1550 lb. per head—the majority of them probably being 1250 lb. There has been a tendency of late to increase the weight, thus, the 200-stamp mill just completed for the City Deep, and designed to treat 4000 tons per day, has 2000-lb. stamps. The recent practice, as exemplified in the mill, is to crush in the batteries without amalgamation to ⅜ in., to which size it is expected that each stamp will crush 23 to 24 tons per 24 hours. The product from the battery goes to dewatering cones and thence to tube mills; nine tube mills taking the crushings from the 200 stamps. The

pulp from the tube mills is delivered to shaking tables, and the resulting sand and slime to their respective cyanide vats. These vats are made of steel plate, the largest of them 70 ft. in diameter by 12 ft. deep, holding 480 tons slime and 2200 tons of water. It is interesting to note that for the tube mills imported flint pebbles are now rarely used; they are satisfactorily replaced by pieces of ore, of proper shape and size, selected and put aside during the preliminary hand sorting. By this change, quite as good work is done in the tube mills, at a lower cost; and, moreover, the introduction of wholly valueless material into the ore as it passes through the mills is avoided.

In the design of the City Deep mill, previously mentioned, Mr. Robeson has introduced several novel features, among shafts, a bearing being placed between each two cams. This is done to reduce the breakage of the shafts, which has become frequent in recent mills, as the stamps have been increased in weight. The stamp stems are carried in solid-iron guides, which are expected to give better service than the old fashioned wooden-plate guides. Owing chiefly to the high cost of timber, the battery frames, as well as the buildings and supports for the cyanide vats are of reinforced concrete. The results of the application of this material for the construction of mill parts subjected to such severe vibration as are battery frames, will be watched with interest.

Elevation of Tailings

The matter of tailings wheels has long been a vexed question. There is no doubt as to their general undesirability, as they must often be of large size and are expensive both in first cost and maintenance. Several years ago, at the Angelo and Cason mills, a number of experiments were made on a special design of Pohle compressed-air pump. A series of these pumps, of large diameter and capacity, were built and fully tested; though they did the work successfully, they were found to be unsatisfactory in point of efficiency, particularly for raising sand. A. M. Robeson, the consulting mechanical engineer of the Rand Mines, has lately designed and introduced at several of the properties of this group, a new centrifugal tailings pump, which is doing excellent work, and appears to have solved the problem of efficiency, combined with low maintenance cost.

Reinforced Concrete Ore Bins

At the Crown Mines, Ltd., two sets of costly reinforced-concrete ore bins are being erected. One of the sets of bins costing $100,000, with its belt conveyers and crushers, is to receive the ore from a seven-compartment shaft, now down to the 2500-ft. level. Another larger set of concrete bins, near the opposite end of the property (which covers nearly three miles of reef and is the largest producer on the Rand) will cost about $150,000.

The shaft referred to has six hoisting compartments, measuring 9x45 ft. in section. The average speed of sinking has been about 85 ft. per month, at a cost ranging from $135 to $150 per ft., not including general expenses, nor power for hoisting and pumping. All the drilling has been done by hand, 45 holes from 36 to 42 in. deep, making a round. At the 2200-ft. level a double-track haulageway, 9 ft. by 14 ft. 6 in., is being driven in each direction from the shaft. Eighteen 6-ft. holes are drilled per round by machines; an average advance of 130 ft. per month being made in each heading at a cost of $20 per ft., not including general expenses. Six drills mounted on three columns are used in each heading. It is intended ultimately to connect this drift through from one end of the property to the other, on the 2200-ft. level, and to install electric haulage. By this arrangement the total product of the mine will be hoisted from two main shafts and treated in two mills, aggregating 600 stamps.

Increasing the Capacity of the Mills

The present tendency in the district is toward the building of larger mills. At the west Rand mines, a 600-stamp mill is now nearly completed which, provided with tube mills, is likely to lower the working cost to a new record. It is expected that the mill will crush at least 22 tons per stamp per 24 hours. Though a large reduction in total working costs has been effected on the Rand within the past few years, it is probable that in the near future the cost of mining and milling at many of the largest and best managed mines will be lowered to $3.50 or $3.75 per ton. If this anticipation be realized, large quantities of ore heretofore considered of too low a grade to be worked at a profit will become available. It may be pointed out, incidentally, that the cost per ton is not the best criterion of efficient work. Large areas of the Rand veins are so narrow that in mining them considerable waste must be broken from either the foot- or hanging-wall. For this reason the output from a given area of stope or per man employed may apparently be increased by sending to the surface and to the mill an excessive quantity of waste, or ore of too low a grade to be worked with profit; that this has sometimes been done is a matter of common knowledge. The proper standard of efficiency is the cost per ounce of gold produced, from a vein of given thickness and value.

The Cost of Mine Equipment

The figures in the accompanying table taken from "South African Mines, Commerce and Industry," show the total equipment costs, including the mills, of twelve representative mines. They are interesting in indicating the large investment requisite for establishing mining operations on the Rand. The total average equipment cost per stamp as shown by these figures is $11,620.

COST OF EQUIPMENT OF RAND MINES.

Angelo	220 stamps	$2,376,930
Dreifontein Consol.	220 stamps	2,415,424
Crown Deep	200 stamps	2,261,848
Geldenhuis Deep	200 stamps	2,012,045
Langlaagte estate	200 stamps	1,633,147
New Kleinfontein	200 stamps	2,541,055
Robinson	210 stamps	1,757,524
Robinson Deep	200 stamps	3.642,450
Rose Deep	200 stamps	2,115,025
Simmer and Jack	320 stamps	5,033,226
Witwatersrand Gold	220 stamps	2,000,951
Witwatersrand Deep	200 stamps	2,308,500
Totals	2,590 stamps	$30,098,125

Detailed Cost Sheets Are Published

On the Rand the excellent custom prevails of publishing detailed reports and cost sheets. This causes a healthy spirit of rivalry among the managers and other officers of the different mines, and doubtless has tended to a general increase of efficiency and economy. It is usual, also to publish annually, estimates of the probable life of each mine. Though such forecasts are necessarily more or less tentative and subject to modification from time to time, they are, nevertheless, of distinct advantage to shareholders and investors. The fact that they are at all practicable points to the exceptional regularity of the reefs as to values and tonnages of milling ore.

The Future of the Rand

The total prospective value of the Rand reefs is a very different and difficult question. Estimates have been made varying between the wide limits of £750,000,000 and £2,870,000,000. No approach to accuracy is yet possible, chiefly for three reasons: The uncertainty respecting a still further reduction in costs which would permit the working of lower-grade ore; the problem of ultimate feasible hoisting depth, and the fact that comparatively little is known about the quantity and value of the ore in the extreme east and west ends of the district. The geological indications are that the reefs of the great basin will probably be found to continue to depths of from 10,000 to 12,000 ft., or even more; whether it will pay to carry on mining at such depths remains to be seen. The opinion has often been expressed that a hoisting depth of 6000 or 6500 ft., measured vertically, will approximate the economic mining limit. But, from an engineering point of view, it is entirely practicable to hoist in stages from depths much greater than any yet reached either on the Rand or elsewhere in the mining districts of the world; and it must be concluded that the problem is essentially a question of the average value of the great quantities of ore lying below the horizon of the present deepest workings.

Gold Dredging in French Guiana

By Leon Delvaux *

Barren overburden 10 to 18 ft. thick is removed in preliminary cut. Pay streak is rarely over 12 ft. thick. New dredge of Syndicat Mana has open-connected buckets, a propulsion-screen tailings stacker and automatic bucket emptier. The dredge is handling 16,000 cu. yd. of gravel per month at a cost of about 20c. per cu.yd.; production varies from 250 to 500 oz. gold per month.

*Mining engineer, 62 Rue Taitbout, Paris, France.

I described briefly in a previous issue of the JOURNAL[1] the gold industry of French Guiana, the old process of hand sluicing in use in that tropical country, and some experiments made for substituting steam dredging for the old and inefficient method of washing. I wish now to refer to a new and successful achievement in gold dredging attained by the Syndicat Mana. The dredge which, in collaboration with L. C. de la Marlière, I designed for this company is the result of the experiments and tests which we conducted in French Guiana over a period of six years, and as this dredge has now been at continuous work for nearly a year, it may be of interest to describe it and to report the results obtained.

MANA NO. 1 DREDGE EMBODIES NOVEL FEATURES

The dredge, known as Mana No. 1, was built to our designs by Lobnitz & Co., of Renfrew, Scotland. The bucket chain is of the open-connected type. The logs and big boulders which are frequently caught by the buckets would bring a heavy strain on the buckets if a close-connected chain were used. The buckets are built up of steel sheet and are provided with manganese-steel pins and bushings. Each bucket has a capacity of 3½ cu.ft., difficulties in transport prohibiting the selection of any larger size.

A simple device of my design is fitted on the main framing near the upper tumbler for emptying the buckets when they revolve around the tumbler. It consists of a steel shovel with steel handle and springs, attached to a frame mounted on an axle. It is worked automatically by the motion of the bucket chain and has proved quite effective, increasing the capacity by fully 40 per cent. when digging in sticky ground, such as is frequently encountered.

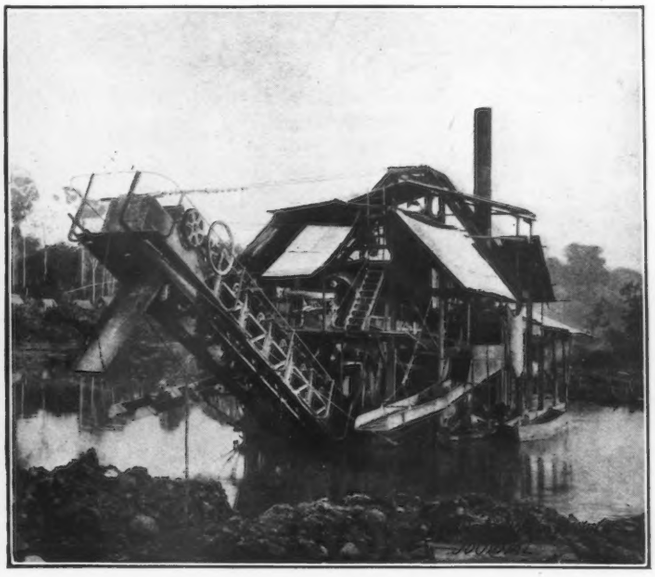
The screening is effected by a shaking screen of a new design, called a "propulsion screen." This screen receives its propulsive motion through a rod connecting it with the revolving shaft without the use of any intermediary gear wheels. By an arrangement of cranks, the motion imparted to the screen is of an unequal character, being accelerated on the outward and retarded on the return stroke. The device acts as an ordinary screen for disintegrating the material and separating the fine from the coarse, and at the same time as a conveyer to discharge the stones and coarse refuse at any required hight behind the dredge, thus doing away with the costly and troublesome tailings stacker.

BARREN OVERBURDEN DUG FIRST

The pay streak in the goldfields of French Guiana is usually not thicker than one foot, and often less than six inches, while the barren overburden on top of the pay streak exceeds 15 ft. in depth. It has thus been found a great advantage to remove for the entire width of a cut, in a preliminary operation, as much of the overburden as can be taken safely without incurring any risk of digging into the pay dirt. This is done at full speed, and, the water being shut from the screen pipes, almost the whole of the material is discharged from the back of the propulsion screen, without falling through the screen holes to the tables. Next the ladder is lowered to bed rock and as the dredge gradually swings back along the cut the pay dirt is carefully washed with the full water supply.

The gold-saving appliances consist of 10 tables, each of which consists of three steps; arranged five on a side. These tables are fitted with wooden riffles which have been found the simplest and most suitable for the prevailing conditions. Quicksilver is used on the tables and some cocoanut matting is laid in the tail sluices.

SYNDICAT MANA'S DREDGE ON ROCHE CREEK ERECTED IN 1909



DREDGE ERECTED IN 1907 ON LEZARD CREEK IN FRENCH GUIANA

[1] "Placer Mining in French Guiana," ENG. AND MIN. JOURN., Mar. 2, 1907, p. 421.

The presence in the pay dirt of a large amount of fine clay requires frequent cleaning-up, and to reduce the loss of time to a minimum, the tail sluices have been fitted with gates, through which the auriferous concentrates are quickly sent to a tank. The dredge can thus be set again in motion, while the concentrates from the tank are being washed at leisure in a small long-tom. The water supply is from a 12-in. centrifugal pump, directly connected with a compound self-lubricating Belliss engine. Such engines, of the inclosed type, while expensive, offer the advantage of not depending for their proper lubrication upon careless natives. The electric plant is fitted with a smaller engine of the same type.

Equipment Sectionalized to 500 Pounds

For the journey from the coast of French Guiana up to the mine (including the passage of some rapids), which requires from 10 to 20 days, small native canoes must be used, and the whole dredge, the total weight of which exceeded 200 tons, was sectionalized in 2500-lb. packages. In spit of the difficulties involved in such a transport, and thanks to the earnest coöperation of the builders and the company's staff, it was possible to start the dredge on Feb. 20, 1910, 11 months after the order had been placed by the owners. This is undoubtedly an excellent record.

The hull was built on the shore and launched in a pond 100x80 ft., which had been dug for the purpose. It was found much cheaper and quicker to dig the pond only to the required depth for the flotation of the dredge and not down to the level of the creek bed, and as soon as the dredge was started we built up a dam across the creek and thus raised the river to the same level as the pond.

In a recent issue of this JOURNAL[2], Albert Bordeaux described the dredging experiment conducted in French Guiana by L. C. de la Marlière and myself and made a reference to our new enterprise for the Syndicat Mana. I can indorse most of the statements made by Mr. Bordeaux, as they were taken from our actual operations, but, correcting his estimates, I figure the monthly expenses as follows: General expenses (Paris office), $200; general expenses in Guiana, management and staff, $650; repairs and renewals, $500; labor, $2000; total, $3300. The first two items will be greatly reduced when working with two or more dredges. The average cost per cubic yard, for a monthly output of 16,000 cu.yd., I figure to be about 20c. Mr. Bordeaux is mistaken when he sums up the results and profits of the three dredges. The two dredges on the Elysée placer (Cie Minière et de Dragages de Guyane) have been idle since the middle of 1909, while the dredge on the Roche creek, which was under our management, belongs to another company.

At first it was necessary to train the native workmen to their task, quite new for most of them, and the dredge operated only 12 hours per day, with one shift. Shortly afterward it was possible to form two shifts and the working time was increased to 16 hours daily, and later on, three shifts were put on, with continuous working day and night. Up to the present, the dredge has been at regular work, stopping only for the weekly rest on Sundays. It proved powerful and efficient and well adapted to the local requirements and the special character of the ground to be treated.

The monthly output of the dredge on Roche creek has been: March, 1910, 358 oz.; April, 280 oz.; May, 668 oz.; June, 484 oz.; July, 313 oz.; August, 250 oz.; September, 478 oz.; October, 506 oz. The record is creditable when the small size of the buckets is considered.

Character of the Ground

As previously mentioned the gold is concentrated in the lowest stratum of the alluvium the depth of the auriferous streak varying from a few inches up to two and rarely three feet; as a rule the thinnest streaks are the richest. This auriferous material consists mainly of gravel, pebbles of quartz and pieces of diorite, mixed with clay and sand; it rests on a soft bedrock of clay originating from decomposed diorite. The top part of the bedrock is frequently auriferous down to a depth of two or three inches, in some instances showing visible gold. Special care must, therefore, be taken when dredging to keep the buckets down to bed rock; each bucket must bring up a small quantity of clay from the bedrock, to make sure that no pay dirt is left behind. At the same time the digging of too great a quantity of clay is to be avoided, as it might block the tables and make washing and gold recovery unsatisfactory. The auriferous gravel and clay are not hard to disintegrate: The greatest part of it is washed free in the first sections of the screen and a large percentage of gold saved on the first two tables (over 75 per cent. of the total output).

The barren overburden which lies on top of the pay streak varies in depth from 10 to 18 ft. In some places it consists mainly of sand and is then easily dug and discharged, but in most cases it is of a clayey and sticky nature and besides being harder to dig, fills the buckets and does not fall out when revolving around the upper tumbler. In a previous dredge this caused a great delay, as the buckets, once they had been filled, went round and round again with the same load and the digging was practically stopped. The problem was solved by the use of the new device, previously mentioned, for emptying the buckets with a spring shovel, when they pass over the upper tumbler.

The dredge digs not only the creek, which is from 20 to 35 ft. wide, but also its banks, the total width of the cut being from 80 to 150 ft., according to the width of the pay streak, and, as the whole of the valley is covered with dense tropical forest, numerous trees, logs and roots have to be removed from the front and

Clearing Away Stump in Front of Dredge in French Guiana

[2]"Conditions for Gold Dredging in French Guiana," ENG. AND MIN. JOURN., Sept. 17, 1910, p. 562.

carried back to the tailings heap. A derrick fitted with wire rope blocks is provided for the purpose so that the trunks and roots are lifted as soon as the digging has cleared them sufficiently. Boulders are not infrequent, some of them weighing up to 12 cwt. They are lifted easily by the open-connected buckets, but must be discharged on the bow of the boat when the buckets pass near the deck on their way up to the upper tumbler. The addition of a strong drop-chute will permit the discharge of these boulders over the upper tumbler to the propulsion screen which will easily convey them to the tailings heap.

Prospecting Methods Employed

The American drill of the Keystone or any similar type is not well adapted to the conditions prevailing in French Guiana. It would be extremely difficult to shift such an outfit from one hole to the next one through the dense forest. Moreover the concentration of large amounts of gold in shallow streaks makes it necessary to test the latter in larger lots than those brought up by the drill. A Dutch drill worked by hand was used to some advantage in the Guianas. Being easy to dismount and light to carry, it was better adapted to bush work, than the huge power-drill, while the total depth of the ground, never exceeding 20 ft., did not require motor driving. However, it is liable to the same objection as the power drill as regards the small quantity of the sample to be tested and I do not believe that it can be absolutely relied upon, unless it is checked at intervals by pits.

The digging of prospecting pits, although expensive, is the best and most reliable method. As the ground is frequently swampy and as in any case water is always found at the depth of a few feet, the proceedure followed was to make an excavation, 12x12 ft., as far down as water would permit. A vertical casing, 6x3 ft. in section, was then built up with planks 12 ft. long, held in position by two frames made of angle bars. The digging was then continued inside the casing, the digger shoveling the dirt out of the top of the casing, while another man with a heavy hammer drove the planks down as fast as digging proceeded. A twin-cylinder hand pump, operated by six or eight men discharged the incoming water out of the pit. As soon as the digger had reached the pay streak, the dirt was carefully washed in a tom and the average yield was thus calculated from the total gold contents of a block of alluvium, 6x3 ft. in section. With a party of eight to 10 men, it usually took from two to three days for each pit. This process, which is rather slow and expensive, is much more accurate than drilling and the actual returns by the dredge conformed closely to the estimates based upon the prospecting results. The halftone engraving which appeared in the Journal of Sept. 17, 1910, p. 563, and which was wrongly described as, "Native Gold Diggings," was taken from our prospecting work on Roche creek and gives a fair idea of the process. It shows the top part of the casing which is being driven down and the exhaust pump used to keep the pit dry, while digging. Of course, this process is only suitable for the banks of the creeks and not for their beds. It is good for narrow creeks, on which the yield does not vary much from the middle of the bed to the banks but would give misleading results on broad creeks. The company is now building a small prospecting dredge which can be easily taken down or shifted from one field to the next, and hopes to be able through the new device to prospect creeks and rivers quickly and accurately, at small expense.

Conclusion

The goldfields of French Guiana have for many years been known to be rich as is evidenced by the large output (100,000 to 200,000) annually obtained from crude and inefficient washing. Many attempts have been made to substitute power dredging for the obsolete sluicing, but in most cases they have led to failure through mismanagement, lack of sufficient capital, or of proper prospecting work, or want of experience in the district. The difficulties to be overcome are not few: An enervating climate; slow, costly and unsafe transport; inefficient labor; great distance of the mines from any industrial center, etc. That they can be overcome, is however, evidenced by the example of the Mana No. 1 dredge. Careful prospecting work and a reliable operating staff are conducive to success.

The Gentle Art of Appreciation

By Mark R. Lamb *

The improvement of the conditions under which miners live and provision of reasonable comforts are duties too often neglected by mine managers.

*Milling and cyaniding engineer, Milwaukee, Wis.

Much is written on the question of the honesty and the efficiency of metal-mine and reduction-works employees. Little is written on the honesty and the efficiency of managers, directors and metal-mining companies as displayed toward employees.

Company Honesty as Affecting Employees

If a miner is kept busy taking ore from a vein which he knows apexes in another property, what chance has his company of convincing him that it is wrong for him to pocket some of the ore? A story is told of a leaser in Goldfield who, after having worked for wages and "pickings," made a rich strike on a lease of his own. When he held up his mine crew at the point of a gun and compelled them to leave the "high-grade" in the mine, his argument was not based on high moral grounds. Such an argument, if attempted, would have left him (physically as well as figuratively) not a leg to stand on. Many mining companies are in no better standing, and the employees know it. When a smelting company—this is a true story—significantly asks an applicant for a position of ore sampler and buyer, "Can you 'make money' for the company?" what can they expect of the man they finally secure?

Blacklisted for not Patronizing Company Saloon

But omitting the comparatively uncommon, how much better feeling prevails when the man who represents the company takes an interest in and plays fair with the men. Not long ago one manager sent a black-list to his mill foreman. This was a list of the amalgamators and helpers who had spent no money during that month in the company saloon! This same company operated a store. Employees taking a vacation (always without pay) were warned not to bring back "contraband" clothes, since it was their "duty" to buy at the company store. The pet names for that store, such as "Robbers' Roost" and "Swindle Shop," indicate the feeling entertained for it by the men. As a climax might be taken the warning to one man that he must prevent any shipment of express packages of fruit to him from his home in California, Such a company and manager are entitled to every consideration—and they get it.

Cheaper to Prevent Malaria Than to Have It

An American company, operating in the "hot country" in Mexico, has great difficulty in keeping men, good or bad, on account of the discomforts of living, the lack of reasonable comforts and the ravages of malaria. The company is making money. It has cheap native labor, and the doctor is positive that he could reduce the fever cases 90 per cent. if given enough labor to clear off and

drain the ground immediately around the camp. The marvelous record made on the canal zone justifies his statement. Many Mexican mines are cursed with fever and the managers of these, as well as of other tropical countries, owe it to their companies as well as to their employees to know and to do the necessary work for preventing fever among their people.

A mosquito hunt, as graphically described in the *Canal Record*, is as exciting as any (other) of Roosevelt's hunts. The fact that the monthly malaria rate suddenly took a jump upward was sufficient indication to the Department of Sanitation that the anopheles mosquito had found a new breeding place in that vicinity, undiscovered by the district inspector. The local inspector's efforts to find this place were supplemented by a second, third and then a fourth inspector. The successful inspector finally trailed the mosquitos to a salt marsh. Since the anopheles do not breed in salt water he waded out several hundred yards and found the outlet of a forgotten drain, through which rain water had been flowing and forming a fresh-water pond, which was black with larvæ and pupæ. When this breeding place was oiled the results were, as they invariably are in such cases—the malaria rate immediately fell.

When a mine manager must resort to having two men for each responsible position, must have a constant stream of contract labor on the road and is himself in bed part of the time drinking quinine solution, would it not be profitable to start a mosquito hunt? It would be an excellent way to show an appreciation of the value of the health, the lives, even, of his men and their families. Almost anything in the way of sanitary policing is possible in the ordinary camp, as the mining company usually owns all the land and most of the houses.

Ice Plants Should Be More Common

The matter of ice, particularly in hot or fever countries, is usually neglected, probably on account of the prevailing ignorance of the simplicity of the small plants. No mine should be without ice when having it means nothing but a few hundred dollars first cost, the operation and power costs being negligible. The traveling expenses of a few men to replace the fever-striken will pay for the plant, and the ice is credited with saving the lives of many fever patients. A few coils of cold brine pipe in a lounging room in the tropics, by freezing out part of the moisture of the air, greatly reduces the difficulty of keeping employees satisfied, and the amount of power required is insignificant.

Company Store Often a Company Steal

The company store is by some companies considered a legitimate source of income. Some times the per cent. of profit is high. What better way is there to tempt an amalgamator, a concentrator man or a precipitate man, whether Mexican, American, Englishman, or Chinese than to charge him $2 for a 50c. pair of overalls? Is "foolish stealing" too hard a title for such a "sale?" To inquire why a man does not spend more in the company store and even to insist on a minimum expenditure there, seems to be thrift gone mad.

A school rarely interests the manager of the small, isolated mine, which is notoriously unpleasant as compared to the large mines. The manager's children (and alas! usually his wife also) are in the city. He can see no benefit to the company in a school for natives, or in the case of American mines, for the children of common miners. There is no doubt that the majority of laborers have an ambition (admit that it is foolish) to educate their children, and even if it does the children no good, a school satisfies the parents and is to that extent a good investment for the company. The laborer gets the impression that his efforts and requirements are considered and appreciated.

Cheap Doctors the Companies' Desiderata

Many companies provide a doctor grudgingly, usually a recently graduated student, who will work for a small salary and experience—the latter not furnished by the company—and who will keep the books and run the store. In other cases he is a dipsomaniac, a drug fiend, or a horse doctor available on account of his misfortunes and satisfactory on account of his being willing to work for low pay. A competent, normal physician is a most valuable asset to a company which wants to keep a desirable force of men. A married man may stay for a time at a camp not so provided, but only long enough to find another position, while the blind manager explains to the blind board of directors that the difficulty of keeping good men is due to the well known restlessness of miners.

The boarding house is such a prolific source of dissatisfactions that it is entitled to a separate volume. The money usually spent on a poor table will supply a good one if proper attention is given it. The best of oil is none too good for the engine cylinder, but the eggs for the miner and the wine for the manager are usually of the same vintage. Instead of owning a saloon, an adequate amusement hall should be built by the company. Anyone in the business can look back to dreary months with little to brighten or relieve the deadly monotony of breakfast, the stope, cold lunch, supper and bed. Such monotony is directly responsible for and strengthens the feeling every man has that he is merely after a stake and will soon be in some other place or business. In commercial lines the employee owns his own home, has a feeling of ownership in his company and endeavors to give good satisfaction in order to hold his position, while in the mine the manager often has more trouble keeping his men than the men have in keeping their positions. There is no valid excuse for the encouragement of this feeling. From a purely profit point of view (since the directors' measure of mining success is money), it is an extravagant management which does not try to evade such conditions. Back of it all lies the resentment felt at undisguised robbery and imposition and lack of appreciation. Rarely does a rich mine afford such a luxury as dissatisfied and imposed-upon employees, and no other but a rich mine can afford it.

Men Should Be Kept Longer

A manager complains of a department head and feels that there must be a better man for the position if he could but be found. Instead of making frequent changes (the average life of a mining position is much short of a year if one may judge by the changes of addresses of the members of the American Institute of Mining Engineers) it is much better to send department foremen to see other mines and plants. They are the best judges of points of practice which are applicable to the home mine, yet to suggest such a trip under pay and with expenses paid would superinduce heart failure for the manager. It is certainly true that a visit by any Mexican company's metallurgist to Pachuca, Guanajuato, El Oro, and Aguascalientes would be worth much more than it would cost, yet how few make it except at their own expense. There are even camps where the half-dozen indispensable technical journals are not seen! There is one method of influencing employees which is little practised in precious-metal mines, which costs little or nothing and which pays enormous dividends. Put yourself in his place! It is an art the practice of which gains friends and partisans and which influences dividends as much in mining as in the manufacture of steel or in politics—the gentle art of showing appreciation.

Therlo and Yankee-silver are the names of two new resistance alloys put upon the market recently by the Driver-Harris Wire Company, of Newark, N. J. Therlo is an alloy of copper, manganese and aluminum which has a low thermo-electric effect against copper (0.3 microvolts per deg. C.) Its temperature coefficient is also low, +0.0000031 per deg. F., and its resistance is 46.7 microhms per c.c. Yankee-silver is another patented alloy, having about the properties of 18 per cent. German silver, but withstands repeated heating and cooling and is otherwise satisfactory where German silver fails.

Nomenclature of Iron and Steel—I

By Henry M. Howe *

Discussion of the anomalies now existing in the nomenclature of iron and steel, and of the methods of eliminating them. Work of the former committee on nomenclature reviewed.

*Professor of metallurgy, Columbia University, New York.

Denn alle Schuld rächt sich auf Erden.

Sec. 1. Far as nomenclature lies in importance below most of the other subjects with which men have to deal, yet so great is the confusion in the minds of many who have discussed the nomenclature of iron that I yield to the temptation to try to clear up both the nomenclature and their minds.

Many of them leave wholly out of sight an essential matter which will not down, viz., that there are actually in current use two different meanings for the name "steel": one meaning which covers the great bulk of the steel of commerce, bessemer, open hearth, crucible, etc., and the other which covers only blister steel and some other products of no present importance. Some of us, of whom I am one, have tried to frame a definition which should cover both these distinct meanings. I must admit that such definitions are only makeshifts, and not very good ones. Further thought leads me to propose either taking the bull by the horns and setting up two distinct definitions to cover these distinct meanings, just as every large dictionary has for a great many of our common nouns two or more distinct meanings, which may have little relation to each other, or else excluding blister steel altogether from the class "steel" and giving it a new name, for instance "blister." On this same plan its French name "acier poule" might be changed to "poule." Such a radical change as this could be made effective only by the authority of an unusually powerful body. It is from this point of view that the following lines are written.

Definitions

Sec. 2. I offer the following definitions. In case of steel, two alternative courses *A* and *B* are given, conforming to the two plans above indicated. *A* gives a main definition (I) of steel, and a subdefinition (II) to cover blister and other weld steels. *B* removes blister from the class steel.

A. Steel:—I. Iron which is cast from the molten state into a mass which is malleable initially at least in some one range of temperature. It is steel whether it can be hardened or not, whether it contains much or little or even no carbon, and for that matter even if it is chemically pure iron. It is sometimes called "ingot metal." With the exception of "blister steel" all the steels which have any present industrial importance fall under this definition.

II. *Weld steel:*—Iron which is aggregated from pasty particles without subsequent fusion; is malleable at least in some one range of temperature; and contains enough carbon (say 0.30 per cent. or more) to harden usefully on rapid cooling from above its critical range. Blister steel and a few other high-carbon steels which are unimportant today, are the only present steels covered by this definition.

Steels of class I have been divided into:

(a) *Ingot iron:*—Steel with too little carbon (say 0.30 per cent. or less) to harden usefully on rapid cooling; obsolescent, and to be avoided because confusing. (See *Sec.* 17.)

(b) *Ingot steel:*—Steel with enough carbon (say 0.30 per cent. or more) to harden usefully on rapid cooling. (Obsolescent, and to be avoided because confusing. See *Sec.* 16.)

B. Or as an alternative to all the foregoing, the following definitions of steel and blister.

Steel:—Iron which is cast from the molten state into a mass which is malleable initially at least in some one range of temperature.

Blister:—Highly carburized iron made by the prolonged cementation of wrought iron with carbonaceous matter, usually charcoal. It has hitherto been called "blister steel."

"Normal" or *"carbon"* steels and cast irons:—those which owe their properties chiefly to the carbon which they contain.

Alloy steels:—Those which owe their properties chiefly to the presence of one or more elements other than carbon.

Wrought iron:—Malleable iron which is aggregated from pasty particles without subsequent fusion, and contains so little carbon (say 0.30 per cent. or less) that it does not harden usefully when cooled rapidly. In Great Britain "malleable iron" is often used as synonymous with "wrought iron," but sometimes at the risk of leaving the lay reader in doubt whether it refers to wrought iron or to malleablized iron. (See below.)

Cast iron:—Generally, iron containing so much carbon (2.20 per cent. or more) or its equivalent that it is not usefully malleable at any temperature. Specifically, cast iron in the form of castings other than pigs, or remelted cast iron suitable for such castings, as distinguished from pig iron, i.e., the molten cast iron as it issues from the blast furnace, or the pigs into which it is cast. There are three chief varieties of cast iron.

Gray cast iron:—Relatively soft, and characterized by the presence of sheetlets of graphite, often forming an irregular skeleton. This is the variety used chiefly for engineering work.

White cast iron:—Extremely hard and brittle, characterized by its lack of graphite.[1]

Mottled cast iron:—Intermediate between gray and white cast iron, and

Malleablized iron:—Iron which is first cast as cast iron and later made malleable without remelting. In practice castings of this variety are first cast as brittle white cast iron, and are then made malleable by converting their carbon from the state of cementite into that of temper graphite or by removing it in part. Malleablized iron differs from steel, (1) usually in containing more carbon, and (2) in being cast into a mass which is not initially malleable. Malleablized iron is not strictly cast iron, but a distinct species, coördinate with wrought iron, steel and cast iron.

I do not think that there is any agreement as to what it is that distinguishes "alloy steels" from "ferro alloys," such as ferro-manganese. To some it may appear better to restrict the name "alloy steel" to those products which are used directly for engineering and other industrial uses, such as manganese steel, high speed steel, etc., and to restrict the name "ferro alloys," e.g., ferro-manganese, ferrosilicon, etc., to those alloys so rich in the alloying metal that they are used solely or chiefly as vehicles for introducing that metal into our mixtures. The objection to this is that an alloy which today is used only for this latter purpose may next year be used for the former purpose. Now, while I think it generally unwise to try to change any well established meanings of the names of the several kinds of iron, because they are primarily trade names and only secondarily scientific ones, yet when, as in the case of these alloy metals, our meanings are in a formative state, we may well strive to guide their formation. Hence I here propose to call those of alloy metals "alloy steels" which are malleable in at least some one range of

[1]White cast iron is used chiefly as a raw material for certain metallurgical processes, because its extreme brittleness unfits it for most direct uses as a material of construction. But the hard faces of chilled cast-iron castings are actually in the condition of white cast iron, to which their rapid cooling from the molten state brings them, though the interior of the casting, cooling more slowly, returns to the gray state which the cast iron used had before melting.

temperature, and those "ferro alloys" which are not. There seems to be no serious objection to this, and it has the advantage that the distinction which it sets up between alloy steels and ferro alloys is the same as that which now exists between carbon steels and cast irons.

VII. *Ferro alloy:*—An alloy of iron with so large a proportion of some element other than carbon that it is not usefully malleable at any temperature. Or, as an alternative definition, iron so rich in some element other than carbon that it is used as a vehicle for introducing that element in the manufacture of iron or steel.

Steel and Malleablized Iron as Trade Names

Sec. 3. The name steel is at times applied to iron made by some slight modification of the process of making malleablized iron. Of course, if the time should ever come when this process was so modified and bettered that its product came to resemble steel closely, and to be its equivalent, one might then argue with some force that the name of this product ought to be changed to "steel." The fact remains that "steel" is not its recognized name and honesty should compel us to call things, in our business relations, by their *de facto* and not by what we conceive to be their *de jure* names. Otherwise we lie under the suspicion of attempting a *suggestio falsi.*

"Steel" a Heterogeneous Class

Sec. 4. Looking at it in a general way, while all cast iron is much alike in containing so much carbon or its equivalent that it is not usefully malleable at any temperature and while all wrought iron is also much alike, being simply iron aggregated from pasty particles, without enough carbon to harden usefully on sudden cooling, the class "steel" is extraordinarily heterogeneous. Every new alloy that is neither clearly cast iron nor clearly wrought iron is named "steel," no matter how radically it may differ from all previous steels in every respect. The only thing that I have been able to discover which all steels have in common is that they are all malleable at some one temperature; but it is mere good luck that has prevented some inventor from attaching the name steel to an alloy brittle at all temperatures.

Slag Content Not a Competent Distinguishing Characteristic

Sec. 5. *"Slag-bearing"* and *"slagless"* are so much more clear and convenient than the circumlocutions "aggregated from pasty particles without subsequent fusion" and "cast from the molten state into a mass," for distinguishing bessemer and like steels, i.e., those which have been melted, from blister steel, wrought iron, etc., i.e., those products which have not been melted, that one is sorely tempted to use them in these definitions. But on reflection this seems unwise, because though there is much less slag in bessemer and like fusion steels taken as a whole than in wrought iron and blister steel, yet some bessemer steels seem to contain much more slag, or at least slag plus iron oxide, than some wrought irons; so that if our definitions rested on the words "slag-bearing" and "slagless," then such slag-bearing bessemer steels would become "wrought iron," which would be contrary to all usage, both good and bad.

Steel—The Rape of a Word

Sec. 6. A brief review of the history of the use of the word "steel" explains why I have given it two perfectly distinct definitions. From the fourteenth century, and probably from a much earlier time, the genus iron included three important known species, steel, wrought iron, and cast iron.

The species steel owed its value to its hardening power, i.e., to the fact that it could be brought at will by thermal treatment, either into a soft, malleable state, in which the desired shape, that of an axe, a sword, etc., could be given it; or into a hard strong state, which gave it great value as a material for tools for cutting and fighting. It was made malleable by slow cooling, worked into shape, and then made hard and strong by rapid cooling from a red heat.

But there were many and useful irons which lacked this Jekyll and Hyde property of being shifted at will from hard to malleable and back. They were clearly not of the species steel: they were clearly *iron.* Certain of these owed their usefulness to the fact that they were malleable, indeed decidedly more malleable and more easily welded than steel. Hence they were currently *wrought* into the shape in which they were to be used. Hence in turn they were usually called *wrought* iron. They were too infusible to be melted and cast into a useful shape. The remaining useful irons owed their usefulness to the fact that they were fusible and hence could be cast into a useful shape. Indeed, it was only by casting that they could be given any needed shape, because they were far too brittle to be wrought into shape. Hence their name cast iron.

Here, then, we had steel, hard and soft at will; wrought or malleable iron the most readily wrought, but incapable of being either hardened or cast; and cast iron, readily cast, but incapable of being wrought. The classification was rational and for a time sufficient. It is shown in Table 1.

Present Classification of Iron

Sec. 7. In Table 2, I set forth the present or bessemer classification, together with certain amendments here under discussion.

Though this classification is so firmly fixed that, for reasons given in Sec. 10, it seems to me unwise to try to upset it, yet we may look briefly at its history in order that we may consider fairly the changes now proposed.

About 1856 Bessemer's wonderful process not only greatly lessened the cost of making Huntsman's cast variety of steel, but did for wrought iron what Huntsman had done for steel, by melting it and so removing its great defect, its inclosed slag. It is this new product, slagless wrought iron, that has caused the difficulties and confusion in our classification. It is actually called "low-carbon" or "mild steel"; but strictly for the purposes of the following discussion as to the propriety of this name, it may be called "X-iron."

Because though malleable it could not be usefully hardened it was clearly not "steel" but "wrought iron" according to the then perfectly established usage. But it had so great a merit in its slaglessness that it deserved a special name, to distinguish it clearly from the old slag-bearing wrought irons which it seemed bound to displace.

A wholly new name, whether "besson," i.e., the iron of Bessemer, or "ingot iron" or any other appropriate one, would have avoided all confusion. But, not content with their right to a new name, its introducers took the existing name "steel" for X-iron; and in order to fix this name firmly they insisted that henceforth "steel" should mean, not hardenable malleable iron as hitherto, but slagless mal-

TABLE 1. HISTORIC OR PRE-BESSEMER CLASSIFICATION OF IRON.

Genus.	Species.	Varieties.
Iron...	(1) Wrought (or malleable) iron; (a) *iron* because not steel, because not hardenable, because deficient in carbon. (b) *wrought*, because brought to shape by working, because malleable.	
	(2) *Steel*, containing enough carbon to harden on rapid cooling yet not enough to make it unmalleable when cooled slowly.	(1) "Cast steel," excelling because freed from slag by being melted, "cast" as indicative of this melting. (2) Other steel, injured by the presence of inclosed slag. (Blister steel, puddled steel, natural steel, etc.)
	(3) *Cast iron*, (a) *iron* because not steel because not malleable, because of its excess of carbon; (b) *cast*, because necessarily brought to shape by casting.	(a) Gray. (b) White. (c) Mottled.

leable iron. Witness Holley's definition: "Steel is an alloy of iron which is cast while in a fluid state into a malleable ingot."

Now, quite apart from the illegitimacy of this step, it set up an anomaly, for the old slag-bearing steels (blister steel, etc.), clearly were not steel in this new sense of the word, yet they were still called steel. Indeed any attempt to wrench this name from them must then have seemed hopeless, so conservative are those who have to do with these older steels. Hence this calling X-iron "steel" and trying to shift the basis of the classification so as to embrace it, in reality only set up a new basis of classification without removing the old; so that both, though incompatible, remained and still remain in use, to plague the classification-shifters and us, their fellows. The old slag-bearing steels are called "steel" because they are hardenable, but X-iron is called "steel" because it is slagless. The former lack the essential, slaglessness, that makes the latter steel, and the latter lack the essential, the hardening power, which makes the former steel.

This attaching the name "steel" to X-iron was due to several coöperating causes. X-iron was made currently in the same vessels, by the same men, and by the same process as the high-carbon bessemer steel, which because it was hardenable was legitimately "steel." Indeed, whether the product should contain enough carbon to be hardenable or not, i.e., whether it should be legitimate "steel" or X-iron, depended solely on how long the process was kept up. It was essentially one of decarburizing, which, starting with the high-carbon cast iron, converted it first into legitimate hardenable steel and then into X-iron, so that in early days the operator could not tell which of the two his product was without a direct test. Hence as regards both manufacture and sale the X-iron industry and the legitimate bessemer-steel industry were a unit, and hence (*A*) a single class name was urgently needed for the important class which these two products formed. This need seems to have been the strongest of these coöperating causes. Again, (*B*) slaglessness was said to be a more useful basis of classification than the hardening power. (*C*) But if propositions *A* and *B* are true, they simply call for an additional or cross-classification, based on slaglessness, and they do not call for changing the meaning of the word "steel." The reasonable and legitimate way would be to create a new name, for instance "besson," to cover the legitimate high-carbon slagless steels and X-iron jointly, so that the iron industry as a whole would be divided into the "besson" industry, the pig-iron industry, the wrought-iron industry and the blister-steel industry. The needed new classification should have had appropriate new names, and should not have taken existing names and completely changed their meaning, just as, if it became more important to classify coal according to its ash than according to its bituminosity, the reasonable and legitimate way would be to redivide it into "high-ash," "medium-ash," and "low-ash," and not to propose that "anthracite," "semi-bituminous," and "bituminous" should henceforth mean "high-ash," "medium-ash," and "low-ash" respectively. Unfortunately this plan was not set forth fully, if at all.

(*D*) Finally, the name "steel" was at that time associated in the public mind with superiority, and steel sold at a price[1] far above that of wrought iron. Hence

TABLE 2. GENERAL CLASSIFICATION OF IRON.

Class.	Genus.	Species.	Variety.	Subvariety.
Iron	Aggregated or Weld Metal, aggregated from pasty particles without later fusion.	WROUGHT IRON, WITH LITTLE CARBON, 0.20% OR LESS.		PUDDLED IRON. BLOOMERY IRON. ETC. ETC.
		Weld (or Wrought) Steel or Blister, with more carbon, 0.20 to 2.20%.		*Blister Steel or Blister.* (a) *Puddled Steel (obsolescent).*
Normal or Carbon Class, owing their properties chiefly to their carbon content.	Cast or Ingot Metal, "cast" as distinguished from "aggregated."	Subgenus A: Classified by carbon content. — *Steel, with either a small or an intermediate carbon content.*	*Low-carbon (or "Mild") Steel,* with little carbon, 0.20% or less.	*Bessemer Steel. Open-hearth Steel. Crucible (Mitis) Steel. Electric Steel.*
			Medium- and High-carbon Steel, with more carbon, 0.20 to 2.20%	*Bessemer Steel. Open-hearth Steel. Crucible Steel. Electric Steel.*
		CAST IRON, WITH MUCH CARBON, 2.20% OR MORE.	GRAY CAST IRON WHITE CAST IRON MOTTLED CAST IRON	NORMAL WHITE IRON. WASHED METAL.
		Subgenus B: Not classified by carbon content. — Malleable or malleablized cast iron, or malleablized iron, not malleable when cast, but made malleable thereafter.		White heart. Black heart.
Special or Alloy Class, owing their properties chiefly to their content of an element or elements other than carbon. (Always cast.)		*Special or Alloy Steels, useful immediately for engineering and like uses, or malleable.*		*Nickel Steel. Manganese Steel. Chrome Steel. High-speed Steel. etc. etc.*
		FERRO-ALLOYS, USEFUL PRIMARILY FOR INTRODUCING AN "ALLOY" ELEMENT OR ELEMENTS OR NOT USEFULLY MALLEABLE.		SPIEGELEISEN. FERROMANGANESE. FERRONICKEL. FERROSILICON. ETC. ETC.

(a) Blister steel is graded according to carbon content into several "tempers," viz:—"Grade 1, spring heat; 2, country heat; 3, single shear heat; 4, double-shear heat; 5, steel through heat; 6, melting heat; 7, doubly converted. Of these the first has the lowest carbon content (given variously as 0.30 and 0.50) and the last has the highest, about 1.90 per cent."

In order to make this table clearer, a special type is used in the "species," "variety" and "sub-variety" columns, for each of the four great species, wrought iron, steel, cast iron, and malleablized iron. The wrought iron is given in Roman capitals, all the different varieties of steel in italics, all the different varieties of cast iron in Roman small capitals, and malleablized iron in Roman small letters. Ferro alloys have small capitals like cast iron, with which they have so much in common.

As there is little to choose between the names "malleable cast iron," "malleablized cast iron" and "malleablized iron," between retaining the name "blister steel" and changing it to "blister" and between basing the distinction between alloy steels and ferro alloys on immediate usefulness for engineering purposes and on malleableness, I have here given all three names in the first case, both names in the second, and both bases in the last, to facilitate discussion. After the choice has been made the rejected forms, of course, would be struck out and the table correspondingly simplified.

[1] In this connection it is suggestive that, whereas in the '70's, when steel was higher in price than iron, X-iron was illegitimately named "steel" by its producers: today, when wrought iron has become higher in price than the steels with which it competes, the introducers of a new variety which is clearly steel, according to present usage, name it "ingot iron."

a much higher price could probably be got for X-iron if it were dubbed "steel" than if it bore the humble name "wrought iron."

Hence in giving the two conflicting definitions of steel at the beginning of this article I simply record usage as it exists today.

Failure of an Attempt at Reform

Sec. 8. For our own guidance we should take to heart the attempt of the Philadelphia committee of the American Institute of Mining Engineers to restore the classification of iron to its historic basis, making the hardening power the essence of "steel," shifting X-iron back to the class "iron" and giving it a distinctive name, "ingot iron," i.e., iron which had been freed from slag by casting it as an ingot, to distinguish it from "wrought" or slag-bearing malleable iron. The committee aimed at two further needed reforms.

(1) In order that the old "wrought iron" might be distinguished readily from X-iron, its name was changed to "weld iron," and very appropriately, because whereas X-iron is just as truly "wrought" to shape as "wrought iron" itself, "weld" calls attention to the true essence of "wrought iron," that it was made by welding together pasty particles within a bath of slag without later taking that slag out by fusion.

(2) It divided "steel," i.e., hardenable iron, into two varieties, parallel to the varieties of unhardenable iron, viz.: "weld steel," i.e., the slag-bearing steels, blister steel, etc.; and "ingot steel," or hardenable iron freed from slag by fusion. This classification is given in Table 3.

TABLE 3 CLASSIFICATION OF THE PHILADELPHIA COMMITTEE OF 1876, OF THE AMERICAN INSTITUTE OF MINING ENGINEERS.

	Malleable.		Nonmalleable.
	Cannot be hardened by sudden cooling. Iron.	Can be hardened by sudden cooling. Steel.	
Cast when molten into a malleable mass	Ingot iron. *Flusseisen.* *Fer fondu.*	Ingot steel. *Fluss Stahl.* *Acier fondu.*	Cast iron.
Aggregated from pasty particles without subsequent fusion	Weld iron *Schweisseisen.* *Fer soudé.*	Weld steel. *Schweiss Stahl.* *Acier soudé.*	

This serious attempt at reform failed completely, and though I strove as hard as anybody for it, the failure seems to me irrevocable. Two reasons why it failed at once suggest themselves.

(1) The group name "ingot metal" for the bessemer products as a whole, X-iron and legitimate bessemer steel together, was inconvenient. The need of a handy name for this group was so great that the trade held to the name "steel" to which it had helped itself. Had the committee offered a really convenient group name, "besson" or some better one, it might possibly have succeeded.

(2) Early as this attempt was, it was too late, for the name "steel" had already been fixed to X-iron so firmly by even these few years of use that the confusion and the trouble to the interested and recalcitrant minority, the makers and the great users of X-iron, incident to a change back to "iron" seemed likely to outweigh the slight inconvenience which the illegitimacy and anomalousness of the bessemer classification gave the inert majority, the rest of mankind, very, very few of whom ever had to consider the classification of iron at all. Illegitimacy is but a feeble charge against a *de facto* classification or government. The anomaly, the dual meanings of "steel," was relatively unimportant, because it really troubled but few and because it was only temporary, for clearly blister steel itself, the only product which called for the second of those two meanings, was bound to go out of existence relatively soon, and with it would go the second meaning.

Sec. 9. *How should we treat the changes in our classification now proposed?* On one hand we are again urged to return to the historic basis, making the hardening power the essence of "steel"; on the other hand we are urged to carry the bessemer classification to its logical conclusion by dropping "blister steel" and the other slag-bearing steels from the class "steel" and erasing the second of the two present definitions of steel. Let us consider these two plans separately on their merits.

Restoration of the Historic Classification Inexpedient

Sec. 10. The return to the historic classification, though a true reform, would call for an outlay of energy out of all proportion to the good it would do. A more competent or authoritative body than the Philadelphia committee could hardly be created. If it failed so hopelessly to displace the bessemer classification so soon after its introduction, how much energy would be needed now, when 35 years of further use have fixed it so much the faster, when the number of makers and users who are wonted to it has increased so enormously, and when few active men can remember the days of the use of the historic classification.

These present disadvantages seem to me to outweigh whatever advantage a new attempt might have in better guidance, and especially in offering a convenient group name such as "besson" in place of "steel."

(To be concluded)

A New French Blasting Explosive

A new explosive has recently been patented by the Société Française des Explosifs Prométhée (French Pat. No. 413,259) known as Prometheus III. It consists of a solid and a liquid, the solid forming 90 per cent. of the final explosive, and the liquid 10 per cent. These components are not of fixed proportions, sample mixtures being as follows:

	Parts by Weight.		
Solid.			
Potassium chlorate, $KClO_3$	85	80	70
Ferric oxide, Fe_2O_3	..	5	10
Powdered aluminum	5	5	10
Total solid	90	90	90
Liquid.			
Essence of terebenth, $C_{10}H_{16}$	7	8	9
Carbolic acid, C_6H_5OH	3	2	1
Total liquid	10	10	10

These two components are compounded separately and in that form may be safely transported or stored. The solid portion is put up in a cartridge, which is soaked with the proper proportion of liquid about 15 to 20 minutes before being used, although the cartridges can be kept for a long time after preparation in case it is desired to do so. The explosive is fired by a fulminate of mercury detonator.

Before mixing, the solid component is as safe to handle as is potassium chlorate alone. The liquid can be burned, giving a thick black smoke, but will not explode. After mixing the cartridge readily takes fire, but will not explode, and can be extinguished by water. If fired by a detonator in open air the combustion is not complete, but is so when confined. In general the explosive is but little sensible to shock and resists warmth and humidity well.

The object of the aluminum is to raise the temperature of the explosion to insure the total combustion of the inflammable liquid. The formula given in the first column of the composition table corresponds very closely to

$$40\ C_6H_5OH + 65C_{10}\ H_{16} + 234\ Al + 880\ KClO_3$$

which would probably give an explosion

$$660\ H_2O + 779CO_2 + 11\ CO + 880KCl + 117Al_2O_3$$

thus the combustion to CO_2 is apparently not quite complete.

It is claimed (*Journ.* Am. Chem. Soc.) that titanium has been prepared in a pure state by reduction of the tetrachloride by means of metallic sodium inside a steel cylinder. It is said to resemble steel, be brittle when cold, malleable at red heat and to melt at 1800 to 1850 deg. C. Its density is about 4.5.

Coal Mining Department

The Important News Of Coal Mining. New Appliances, New Methods. New Fields, Colliery Engineering

The European Markets for American Coal

Coal producers in the United States are commencing to realize that the European coal market is a field worthy of consideration. France produces less than 40,000,000 tons of coal annually, and the consumption of the country is considerably in excess of this production. Great Britain and Germany furnish most of the coal that is imported into France. It appears that up to the present time, no attempt has been made to bring American coal into France, although a study of conditions indicates clearly the possibility of American coal becoming a strong competitor.

Some months ago, a company was in process of formation in the United States, with a view of exporting coal to Spain, France and Italy. The promoters of the project contended that they could undersell English coal in those markets, provided the fleet of ships, which it was proposed to build for this purpose, could be assured of return cargoes. Investigation showed that contracts could be made in Spain, for a sufficient quantity of iron ore for return freight to the United States; it was understood that the ore could be furnished in any quantity, but nothing further was done by the American promoters. Spain consumes about 6,500,000 tons of coal annually, of which, 2,500,000 tons are imported.

Increased Use of Mining Machines

An interesting compilation dealing with the use of machines in mining bituminous coal in Pennsylvania, appears in a recent bulletin issued by the U. S. Geological Survey. The reports says:

"The number of mining machines in use in the bituminous mines of Pennsylvania increased from 5103 in 1908 to 5616 in 1909, and the machine-mined product increased from 52,447,809 short tons to 57,504,188 short tons. The machine-mined product in 1909 represented 41.68 per cent. of the total output, against 44.76 per cent. in 1908. Of the 5616 machines in use in 1909, 3847 were punchers, 1710 were chain-breast, 38 were longwall, and 21 were chain-shearing machines. In 167 mines punching machines were exclusively used and in 145 mines only chain-breast machines were used. In the mines using punchers exclusively, the number of machines was 3132 and the machine-mined product was 22,741,280 short tons, or an average 7261 tons for each machine. The exclusively chain-machine mines employed 1265 machines in the production of 24,016,842 short tons, an average of 18,986 tons to each machine. In making these comparisons, however, it should be remembered that a large number of the punching machines are used in entry and other narrow work, to which the chain machine is not adapted, and in which the tonnage won is much less than in the straight-room mining.

Member of Rescue Party Sacrifices Life

An act of great heroism occurred in the Bellevue mine, of the West Canadian Collieries company, on the night of Dec. 9, after an explosion had wrecked a large part of the underground workings. The afflicted property is located two miles east of Frank, Alberta, on the Crow's Nest branch of the Canadian Pacific Railway. Immediately after news of the disaster was spread, first-aid parties from the government station and from neighboring coal companies began to arrive at Bellevue, and rescue parties equipped with oxygen helments descended into the workings to save the imprisoned miners. The first group of rescuers to enter the danger zone was led by Fred Alderson, who personally succeeded in getting five other miners out of the poison gases, thereby saving their lives. While the party was making its way back to fresh air, Alderson saw an unknown Italian fall to the ground, and, hastily picking up the unconscious miner, removed his own helmet, placing it on the head of the helpless man. Alderson then started to run to fresh air, thinking he could stand the poisonous fumes until he could get out; however, he had not gone more than a dozen yards before he was overcome, and fell unconscious in the roadway. Some of his party saw Alderson fall, but they were in such bad shape themselves, in addition to the fact that they were dragging other unconscious men to safety, that they could not help their prostrate leader.

Help Arrives Too Late

As soon as the rescuers reached an air station, they left the men they had carried out, and rushed back to save Alderson, but found him dead before they arrived.

Alderson left a widow and four young children. The miners at Hosmer promptly initiated a movement for the benefit of the bereft family, and public subscription lists were opened in several towns in eastern British Columbia and at others in Alberta. The government of British Columbia has shown its appreciation of Alderson's heroic conduct by subscribing the sum of $500 to the fund being accumulated for the benefit of the widow and orphans.

A coroner's jury is investigating the cause of the disaster. The first witness called was James Burke, secretary of Bellevue local union of the United Mine Workers of America, who testified to having, on Dec. 3, telegraphed the Chief Inspector of Mines at Alberta asking for an inspection of the mine, the presence of gas in the workings having been reported by miners.

Explosion in Anthracite Mine

Special Correspondence

An explosion of powder or gas at the Hughestown No. 10 colliery of the Pennsylvania Coal Company at Pittstown, on Jan. 25, wrecked a section of the mine and killed or injured a number of the workmen. Six men were brought out of the colliery by rescuing parties, four of them being fatally, and the other two seriously burned. Scores of mine workers managed to escape by getting out of emergency openings as soon as the shock of the explosion was felt.

In the afternoon, on the day of the explosion, after five more injured men were brought out of the mine, the officials reported all out. Forty men who were shut in and had a narrow escape made their way out safely. Of the 11 injured six are fatally burned and five are seriously hurt.

Statistics for many States covering coal operations during the last few years, indicate a decrease in fatalities due to mine explosions, but an alarming increase in deaths due to falls of sides and roof. It appears certain, therefore, that the attention of coal-mining men must be largely directed to a better system of timbering, and the adoption and enforcement of carefully considered rules, regulating the placing of props and the withdrawal of timbers.

Model Coal Mine at Marianna

By A. C. Beeson *
and Floyd W. Parsons

Fourth of a series of articles describing the equipment and methods at Marianna. Compressed-air undercutting machines are used exclusively, and a number of hydraulic mining cartridges are in daily operation.

*Chief engineer, Pittsburg-Buffalo Company, Frick building, Pittsburg, Penn.

The machine shop at Marianna is conveniently located near the Agnes shaft. It is a fireproof building 66x182 ft., two stories high. The basement is 12 ft. high, while the second story extends to the roof. The total hight is 57 ft. from the top of the foundation to the top of the ventilator. Both standard and mine-car gage tracks lead onto the main floor, which is spanned by a 25-ton electric traveling crane capable of handling an entire railroad car or any part thereof. The ends of the building are closed by steel rolling doors. Turntables are provided which connect tracks to all parts of the main floor and basement, the latter being served by one 5-ton and one 2-ton elevator. The necessary storage and supply rooms and office are separated by fireproof partitions. Besides the 25-ton crane, there are also three smaller traveling cranes and a jib crane.

THE MACHINE SHOP AT MARIANNA IS NOT ONLY ABLE TO MAKE ALL NECESSARY REPAIRS TO MINE MACHINERY, BUT IS EQUIPPED TO FABRICATE STRUCTURAL STEEL AND BUILD TIPPLES

The machine shop is equipped as follows:

1—24-in. Gould & Eberhardt high-duty shaper, with motor.
1—21-in. Standard Gisholt lathe, with motor.
1—Set standard tools.
1—24-in. American screw-cutting lathe, with motor.
1—18-in. American engine lathe, with motor.
1—Brown & Sharpe N-3-A universal milling machine, with motor.
1—No. 4 G. Allen's plain sensitive drill frame, with motor.
1—No. 5 14-in. Rockford lathe, with motor.
1—No. 10 Prentice radial drill, with motor.
1—2½-ft. Hilbert radial drill, with motor.
1—24-in. sliding-head Prentice drill upright, with motor.
1—48-in. grindstone.
1—10-h.p. motor for mortising machine.
1—Brass furnace.
1—1100-lb. steam hammer.
1—400-ton wheel press, with motor.
1—Colloday band saw.
1—Atlantic mortising machine, with motor.
1—Colloday jointer.
1—Colloday planer.
1—Turning lathe, 8 ft.
1—Drill press, 30 in.
1—Lathe, 24x12 in.
1—American planer, 30x30 in.
1—Bolt-cutting machine.
1—Keyseater.
1—No. 5 bulldozer.
1—10-h.p. motor.
1—No. 5 Rockford drill press.
1—No. 14 Allen drill press.
1—72-in. new model Colburn boring and turning mill, with motor.
1—48-in. Niles steel wheel lathe, with motor.
1—48-in. Niles car-wheel boring machine, with motor.
1—18x3-in. Ransom double-energy grinder.
1—20-1¼-in. Ransom wet-tool grinder.
1—246 B Schatz punching and shearing machine, with motor.

This will enable the Johnetta Foundry and Machine Company, which will operate the shop, to make all repairs required by the Pittsburg-Buffalo Company at its various mines, and do a general foundry and machine-shop business. The shop will be able to make all ordinary repairs to railroad and mine cars, mine locomotives and mine machines; also to build mine cars, frogs and switches, fabricate structural steel and build tipples, etc. All manner of carpentry work can be executed and forgings and brass castings turned out.

THE WATER SUPPLY

A brick pump house is conveniently located between the Rachel shaft and the concrete intake constructed in Ten-Mile creek, the situation of the pump house, furthermore, is adjacent to the pipe tunnels.

Here is housed a 12x24x8x15-in. Jeanesville compound steam pump, having a capacity of 700 gal. per min. This pump is a duplicate of the one installed for drainage in the mine. It discharges through a 10-in. pipe to a circular concrete-lined reservoir, 200 ft. in diameter, having a capacity of 2,000,000 gal., which is located at an elevation of about 300 ft. above the pump.

From this reservoir an 8-in. supply main leads to the boiler house, ovens and washer, and two 8-in. lines lead to

the town. The water system is practically complete as described, and will shortly be put into regular operation.

The Miners' Houses

The houses are of four, five and six rooms, built substantially of brick, with reinforced concrete and tile floors and slate roofs. The dwellings are thus practically fireproof and still pleasing in appearance. Each house is provided with hot and cold water, a complete modern bath room, electric lights, and, if the tenants desire, natural gas is also furnished.

The houses are spaced well apart and each is provided with a fenced lawn and garden of generous size. Fruit trees are planted in the gardens, and shade trees along the streets. These are well graded and have concrete sidewalks. A complete sewer system that compares favorably with those of large cities has been installed, and pure drinking water is furnished from wells sunk deep into the Waynesburg sandstone.

The hillside situation of the town is most excellent for the health of the people, and affords a beautiful view over a large portion of Washington and Greene counties.

The Amusement Hall

The management of the company has long realized that the workmen and their families, especially in isolated locations, are entitled to some diversion, and that the provision of such proper and wholesome entertainment is not only a kindly, but a wise, and in the end a profitable undertaking. It has been the practice of the company in constructing recent plants to build amusement halls.

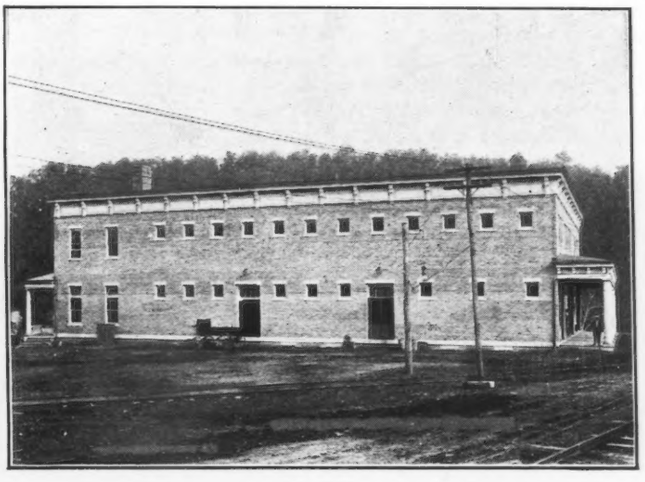
At Marianna a two-story building 63x 107 ft. was built for this purpose. The basement contains seven pool and one billiard tables, and is provided with convenient chairs and lavatory. The first floor is occupied by eight standard bowling alleys with all necessary fixtures, including plenty of seats for spectators. The second floor can be used either for roller skating or as a theater, having a seating capacity of about 600 with elevated stage, asbestos curtain, scenery, moving-picture booth and dressing rooms. The seats are movable, so that it is used on alternate nights for skating and vaudeville shows. Toilet and rest rooms are provided, as well as a reading room occupied by the Y. M. C. A.

The finish and fittings, while not elaborate, are of good quality and taste, and everything was done to make the building a pleasant and attractive meeting place for old and young. The building is not of the same construction used in the mine buildings, having paving-brick outer walls, wooden partitions and wooden floors supported on steel beams and interior columns.

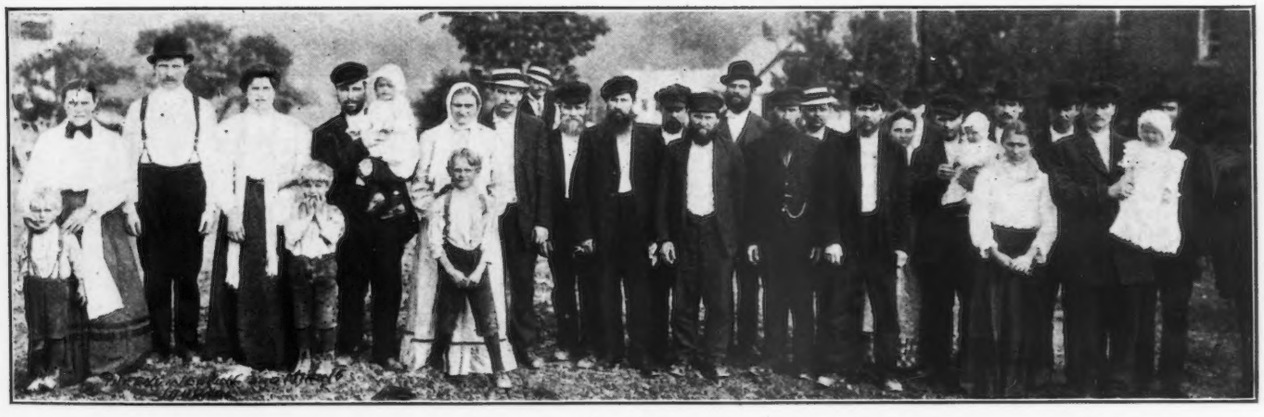
In designing and building the plant at Marianna, certain aims have been constantly kept in view. The location and design of all the parts was, of course, determined mainly by consideration of economy and efficiency in producing coal of high grade at the least ultimate cost. At the same time it was realized that a mine is not a mere machine but also a social institution, and care was taken to provide for the needs of the workers, in having working places protected from the weather and safeguarded as far as possible from accident, and in providing comfortable and pleasant home surroundings.

The smokeless making of coke and burning of coal under boilers, contributes no little to these conditions, while at the same time effecting considerable economy

View Showing General Style of Brick Dwelling Erected at Marianna.



The Company Store Is Substantially Built of Brick and Is Modern in Every Respect



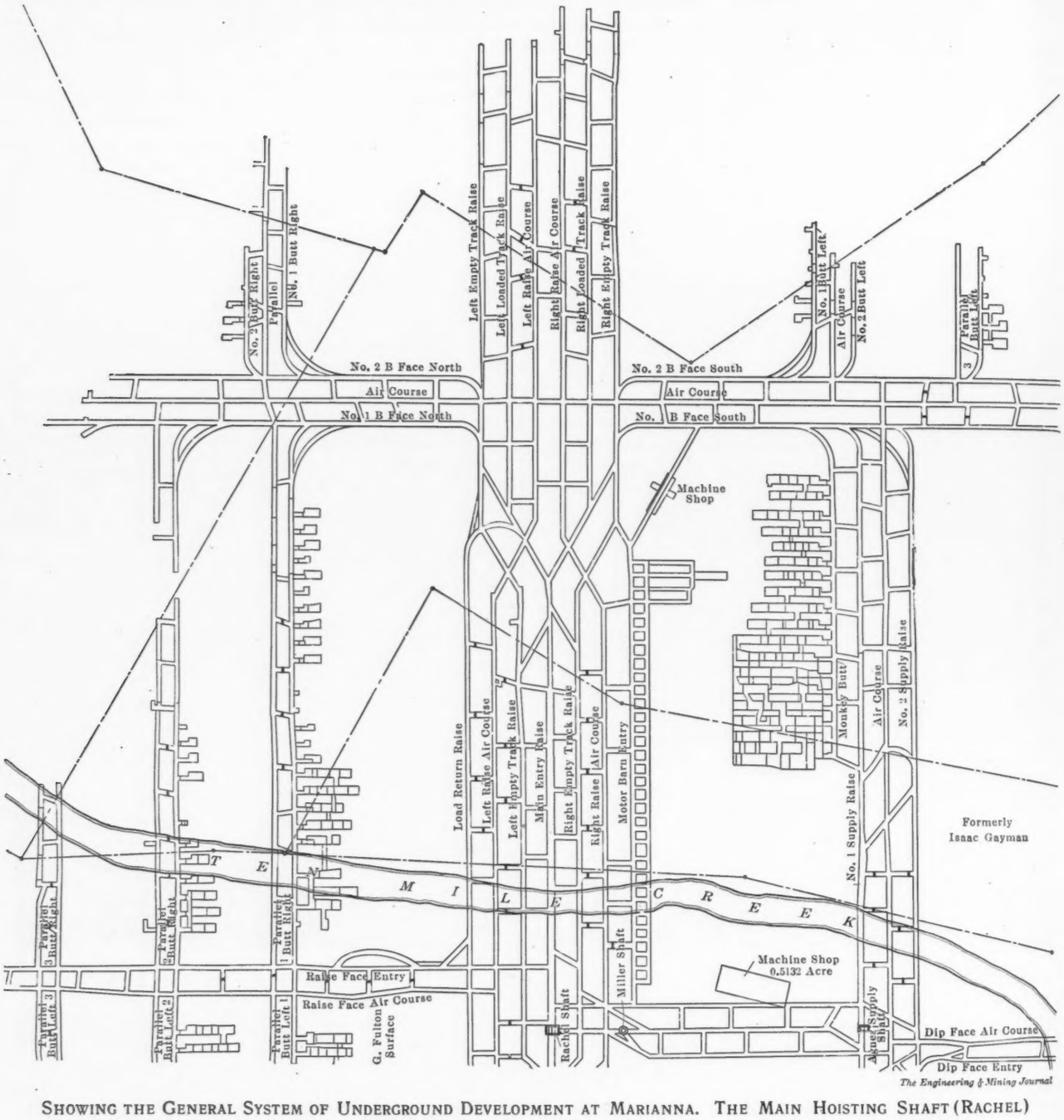
The Employees at Marianna Are Made Up of Many Nationalities. This View Shows a Typical Group of Russian Miners

at the plant. The conveniences at the bath house also contribute greatly to the comfort and well being of the men, and by removing the inevitable dirt of the working clothes from the home, materially lighten the labors of the housewife and improve the home conditions. The sanitary conveniences of the homes and

The Mine Workings and General System of Development

The underground workings are reached by the shafts before described. These are lined with timber in the manner usual to the region. These shafts were projected before the recent successful introduction

The shafts are located in a central position in the coalfield and in a portion of the seam of low elevation, so that favorable grades are secured for haulage and drainage on two principal axes reaching practically the whole mine. From the shaft on the raise side, six entries were driven on the butts of the coal,



Showing the General System of Underground Development at Marianna. The Main Hoisting Shaft (Rachel) Is at the Bottom and Center of the Drawing; the Agnes Shaft Is at the Bottom to the Right

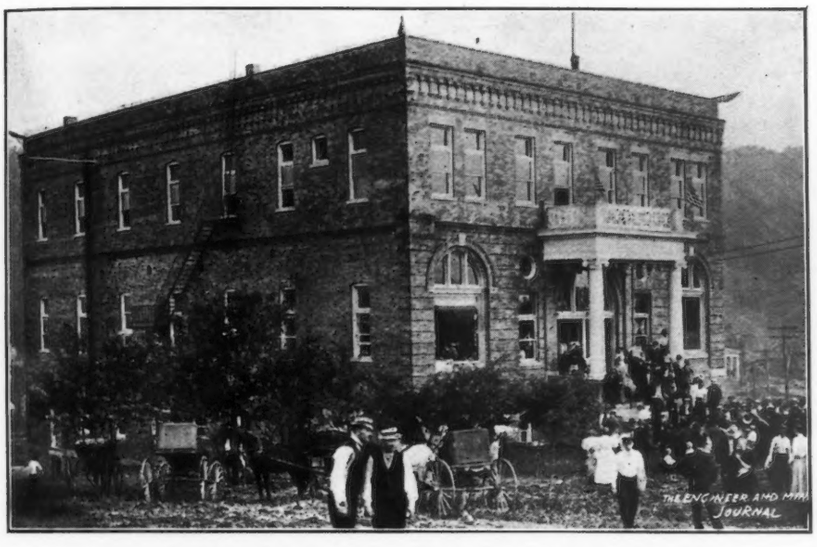
the municipal improvements above described, all of which are generally conspicuous by their absence in mining towns, the provision for wholesome and attractive amusement and the generally considerate attitude of the company toward the men, cannot fail in attracting a high class of labor to the mine.

of concrete-lined shafts. A study of the latter material and of the experience at other mines in its application, has convinced the company's engineers of its superiority, and concrete is now being used in the new developments. The mine is worked on the room-and-pillar system as shown in the accompanying map.

and on the empty side five entries lead off. Three main-face entries are driven right and left every 1400 ft. Three entry butts are driven from these main-face entries, being spaced to leave a pillar 500 ft. wide. From these entry butts, rooms 21 ft. wide and 250 ft. long are driven on sights having 42-ft. centers.

The ribs are drawn as soon as the rooms are up. All entries are 10 ft. wide, the face entries having 60-ft. centers and the butts 50 ft. Protection pillars 100 ft. wide are left on each side of the main heading.

The mine floor consists of about 4 ft. of fireclay, which is of a firm character, not given to heaving. Below this clay is a stratum of hard limestone. The draw-slate has, in general, a thickness of about 8 in. The roof coal is about 2 ft. thick and is left up, making a good roof. Above the roof coal is a stratum of black slate about 45 ft. thick, which breaks readily in rib drawing. The strata above this consist of alternating layers of slate and limestone up to the Waynesburg coal.



THE AMUSEMENT HALL AT MARIANNA CONTAINS A THEATER, SKATING RINK, POOL TABLES AND BOWLING ALLEYS

The mine, without being dry, makes comparatively little water, about 400,000 gal. being pumped at present per 24 hours. This is drawn from an area of about 300 acres, and is elevated to the surface by a Jeanesville pump, a duplicate of the surface pump already described.

An unusual amount of underground development work was done at Marianna, in advance of room mining, in order to secure the required capacity. About 30 miles of entries have been driven to date.

INGERSOLL-RAND HEADING MACHINES AND HYDRAULIC MINING CARTRIDGES

The coal is undercut in the rooms with air-operated chain-breast machines, an undercut of about 6 ft. being made. The machine miners are paid in the usual way, namely, by being assigned certain sections and receiving a specified price per ton for all coal from it. The entries are driven by air-punching machines used only for undercutting. Several Ingersoll-Rand heading machines have been ordered. It is expected that these machines, while making a large percentage of fine coal will prove economical on account of the rapidity with which headings can be driven.

Shot holes are drilled by the miner, who also provides the necessary permissible explosive and clay tamping. The shot-firers load the holes and fire all shots; they are paid by the company and are responsible to the mine foreman. During the past year, tests have been conducted to decide what size of hydraulic mining cartridge to use, and it has been determined that the 4-in. 5-piston machine is best adapted for the seam worked at Marianna. A large number of the 4-in. cartridges are now in use, and it is hoped that this device will ultimately permit the company to do away with explosives altogether.

The next article dealing with operations at Marianna will describe the ventilation, haulage and general safety precautions.

Prevention of Smoke in Berlin

The comparative absence of smoke in Berlin is due partly to the use of fuel briquets. Consul General A. W. Thackara states that 30 per cent. of the coal fuel consumed in the city and suburbs is brown-coal briquets, and it has been technically demonstrated that, having been produced without the addition of a special binder, they burn with less smoke than any other briquets. Considerable coke is also used in Berlin. The coal briquets produced in Germany increased from 9,250,000 tons in 1901 to about 16,300,000 tons in 1907, while the production in 1910 will exceed 18,000,000 tons.

The yield of diamonds in German Southwest Africa in 1910 is estimated at 850,000 carats.

Rules Governing Timbering in South Wales

For the guidance of those readers who may not be acquainted with the systematic timbering rules governing operations in Great Britain it may be appropriate to reproduce the rules in force in the South Wales area, as follows:

(1) *Propping of Roof*—Where the timber is used to support the roof, the owner, agent, or manager should keep posted up at the mine a notice specifying for each seam, or district of a seam, the maximum distance apart at which props or other roof supports at the working faces where persons are employed in getting and filling minerals, are to be set, and the persons setting props or other roof supports should see that this maximum distance is not exceeded, provided that nothing in this rule shall prevent the setting of timber where it is required in the interests of safety, at a less distance than that specified in the notice.

(2) *Spragging Where Holing is Being Done*—Sprags or holing props shall be set as soon as there is room, and the distance between such sprags or holing props should not exceed 6 ft., or such less distance as shall be ordered by the owner, agent or manager.

(3) *Supply of Timber*—A supply of suitable timber, reasonably sufficient for the work that is being done, should be kept either at each man's place where mineral is being gotten, or at the nearest point thereto that is reasonably practicable.

(4) *Drawing Timber*—Wherever timber has to be withdrawn from the waste or other disused parts of the mine, the prop drawer shall have with him a "dog and chain," or other suitable appliance ready for use.

Lignite Mining in Texas

BY ALVIN GRAY*

The lignite coals of Texas are excellent fuel for stationary plants and domestic purposes. The coal-mining industry in Texas, at present, is not extensive, but the time is not far distant when the State will rank as an important coal producer. There are thousands of acres of lignite coal in several counties of Texas.

The coal runs from 4 to 10 ft. in thickness, ranging from 30 to 90 ft. under the surface. At different places in the same section, coal is found at a depth of 125 ft. The seams have no gas or firedamp. The lignite is easily mined and it takes less money to put such a mine in operation than it does to develop any other class of coal in existence. The operators in Texas have found lignite mining a profitable business.

*Mine manager, Como Lignite Mining Company, Como, Texas.

The Miner at Home

By P. M. Greer*

The article which Colonel Theodore Roosevelt has contributed to the January issue of *The Outlook* is naturally and necessarily superficial in its interpretation of the life of the anthracite miner at home. Colonel Roosevelt had neither the time nor the opportunity to make a personal and unbiased investigation of the forces, social, economic, and political that are molding the destiny of the miner and his family. These are not palpable; they do not lie upon the surface. They are, like all social conditions, intricate, complex, permanent or evanescent. Colonel Roosevelt visited the homes of a few miners and found conditions, if not ideal, certainly participating in all the domestic felicities that can be found in homes of any similar class among wage earners in any leading industry in the country. A matter of much importance in this connection, to my mind, which was not evidently brought to Colonel Roosevelt's attention, is the gratifying fact that divorce is scarcely known among mining communities, although the facilities for obtaining divorce in the county courts of Pennsylvania is little more than a matter of form, and thousands are listed every year, by working men throughout the commonwealth.

Miner's Amusements

Colonel Roosevelt says that there is a lack of facilities for the amusement of young people in the anthracite regions. I do not think so. The fact of the matter is that theatrical, musical, and social forms of amusement are as common in the anthracite regions as they are elsewhere. Welsh miners are celebrated for their choral concerts and competitions, the foreign miners have a natural love for music and some of them are really brilliant performers. To listen to a large audience of Polish or Russian miners singing their respective national anthems is as impressive as it is pleasing, while a miner's *eisteddfod* is rather bizzare to the uncultured ear through the excessive precision with with which the solo and concert singing are estimated. A few days before Christmas, a working miner conducted Handel's *Messiah* performed by a chorus of two hundred and fifty voices with singular ability and consummate success from a technical and emotional standpoint. Had Colonel Roosevelt heard it, as I heard it, I am sure that he would come to the conclusion that I did, that there are few cities in the United States outside of the anthracite regions where a similar spectacle could be witnessed, where practically every man and woman in the chorus, the orchestra and in the solo parts were miners or the wives and daughters of miners.

*Scranton, Penn.

The Effect of the Dance Halls

I am not criticizing Colonel Roosevelt's appreciation of the social conditions in the mining regions. As far as they went they are exact, but it seems that facts are too few upon which to found even his circumspect generalizations. It is absolutely true that the dance hall as an institution is baneful, not so much from its associations, which are morally speaking, more or less of a negative character, but from its wasteful dissipation of time. I know young men who, after a hard day's work in the mines, go straight to the dance hall and remain there until midnight, doing this not once or twice a week, but almost every night in the week. The dissipation of their time is bad enough and sad enough, but the consequence is even worse than this, for these young fellows, taken at an early age from school, seldom acquire a taste for any sort of intellectual culture and the consequence is that they become men without participating in that mental training, which after all matters most in life.

Young Miners Enter Crowded Professions

One of the consequences of this state of affairs is that these boys and young men when they become mature, become discontented with the mines. They declare "that there is nothing in them" and use up five or six years of the most valuable part of their lives in becoming lawyers, doctors or dentists. The more successful and ambitious of them crowd professions that are already plethorically overcrowded and live from hand to mouth, eking out an existence at the bar or in medicine, while efficient miners capable of earning excellent wages are at a premium. The discontent of the American miner with his position, because he is a miner and not something else, is in striking contrast with the pride and contentment of the average British miner, who is so invariably proud of his calling, proud even of its incidental risks as far as they segregate him from the immunity of other callings.

This discontent can, in my opinion, be largely attributed to the lack of intellectual culture in the true sense, of the American miner, and this is the consequence more or less direct of the influence of the dance hall and its proximate or remote influence on the boy as he develops into manhood and from manhood into middle age.

So far as my observation goes there are few dance halls associated with the saloons. It used to be so, but the judges who grant the licenses, the police and public opinion are antagonistic to such a combination and except in the more remote hamlets, I think that such association is nearly a thing of the past. Colonel Roosevelt says that young men and young women must amuse themselves, that it is a psychological necessity of youth. That is true; but I think that, with a modification in the idea of what constitutes amusement, it would not be difficult to bring our young people to a realization of the fact that much more amusement can be secured by educating one's head rather than one's heels, even of a sentimental kind.

Number of Saloons Is Decreasing

But one of the greatest reformations that has been brought about in recent years in the moral and social conditions of the miners is the diminution of drunkenness and the relative diminution in the number of saloons. A lieutenant of police informed me a few days ago that the decrease in the number of arrests of mine workers for drunkenness and drunken brawls was as extraordinary as it was satisfactory. The foreign miners who came to this country fifteen or twenty years ago have now grown up families who are scarcely distinguishable from their Anglo-Saxon neighbors in psychological traits. Young girls of Polish, Lithuanian or Russian extraction will not associate at a dance hall or elsewhere with the oafs and drunkards of their own nationality on any terms. The young men on the other hand are equally discriminating in their associates and the effect of this eclecticism is obvious on every hand.

I do not believe that artificial cultivation of the dance hall or its environment will relieve it of its disreputable associations wherever these exist. It is in the nature of the institution to be what it is.

What is Most Needed

What is most needed at present among native and foreign mine workers, is the inculcation of esthetic ideas in their homes. It is scarcely possible to do this in the "company houses," or houses that have been erected and rented on the same principle. The foreign miner, even if he had the taste, has not the stimulus to effect a reform in this direction. He lives in a species of caravansary, not a home.

The anthracite miner is not a subspecies of the genus homo. He is neither better nor worse than his fellows. He breeds true to the type, and although his environment may bring out saliently, certain psychological traits that might be suppressed or eliminated in the individual if he were a judge or a preacher, a soldier or a sailor, rather than a man who digs coal in the bowels of the earth for a living, yet taking him all in all he is a good man, an excellent father, and if his political faith is not debauched by political adventurers he is equal to all the responsibilities of citizenship.

During the year 1910, the State of Pennsylvania with a total output of approximately 225,000,000 tons, produced more coal than any foreign country except Great Britain.

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Frank J. Probert has returned to Los Angeles.

John Hays Hammond has returned from Europe.

John E. Chase is in Cochise county, Arizona, on professional business.

W. P. Murray, of Pickands, Mather & Co., Cleveland, Ohio, is spending some weeks in Cuba.

Henry M. Lancaster has removed his office from Wallace, Idaho, to the Hutton building, Spokane, Washington.

Leo Von Rosenberg has removed his office to the ninth floor, Bowling Green building, No. 11 Broadway, New York.

Baylor Hickman, of the iron firm of Hickman, Williams & Co., spent some days in the Birmingham district recently.

Robert H. Richards has recently returned from a professional visit to Joplin, Mo., where he went to look into the operation of his jigs and classifiers.

William M. Byrd, Jr., of the iron firm of Hammond & Byrd, has been in New York on business. The firm has established several branches in the West.

Guy C. Stoltz, mining engineer at Mineville, N. Y., spent last week at the Forest of Dean iron mine, near Fort Montgomery, Orange county, New York.

C. R. Thompson, lately professor of mining at the University of Leeds, England, has been appointed principal and professor of mining at the South African School of Mines.

H. W. Hardinge is making a professional trip through the West, and on his way back will visit a number of milling plants that have installed the Hardinge system of ore reduction.

Frank L. Sizer, for many years a resident of Helena, Mont., is now superintendent of the mines of the Balaklala Consolidated Copper Company, at Kimberley, California.

George Gordon Crawford, president of the Tennessee Coal, Iron and Railroad Company, was married last week to Miss Margaret Richardson, of New Orleans, La., and is now on a bridal tour to Europe.

Chester Tripp, general manager of the Rogers Brown Ore Company, in company with H. J. Kruse, local superintendent, has just completed a trip of inspection of the company's mines on the Cuyuna range.

Ernest H. Rowe has been elected secretary of the Coke Producers' Association of the Connellsville region, Uniontown, Penn., succeeding George B. Irwin, who resigned on account of ill health.

A. W. Allen returned to London last month from Mexico, after completing the erection of the new mill for the Torres-Cherokee Company at San Julian, and left again almost immediately for Uruguay.

Prof. H. S. Monroe sailed for the Mediterranean on Feb. 4, intending to be absent from this country until late in the year. This is Professor Monroe's sabbatical year, and he proposes to spend it in taking a much needed vacation.

W. W. Broughton, St. Paul, Minn., has been elected vice-president of the Pittsburg Coal Company, succeeding C. E. Wales, resigned. Mr. Broughton recently resigned the position of general traffic manager of the Great Northern railroad.

L. C. Triplett, recently mill manager of the Alvarado Mining Company, has accepted a similar position with the Guanajuato Development Company, Guanajuato, Mexico. William McLaughlin, recently of Durango, succeeds Mr. Triplett at the Alvarado.

Clarence W. Watson, recently elected Senator from West Virginia, has resigned his position as president of the Consolidation Coal Company, but will remain as chairman of the board of directors. J. H. Wheelwright, late vice-president, has been chosen president in place of Mr. Watson.

OBITUARY

Calvin B. Orcutt, president of the Newport News Shipbuilding and Dry Dock Company and of the Chesapeake & Ohio Coal Company, died Jan. 30 at Johns Hopkins hospital, Baltimore, where he had gone for an operation. Mr. Orcutt had lived in Elizabeth, N. J., all his life. He was for a number of years president of the Chesapeake & Ohio Coal Agency Company, and was prominent in the early development of the New River and Kanawha district in West Virginia.

John C. F. Randolph died at Morristown, N. J., Feb. 3, aged 64 years. He was a graduate of Princeton in 1866 and of the Columbia School of Mines in 1869. For many years he practised as a mining engineer. He was in government service in Germany from 1869 to 1871 and in Japan in 1874. At one time he was national commissioner of mines in Tolima, Columbia. He was resident manager of the Borneo Diamond Exploration Syndicate in the year 1890. He was unmarried. He joined the American Institute of Mining Engineers in 1875, but resigned last year.

SOCIETIES and TECHNICAL SCHOOLS

American Institute of Consulting Engineers—The annual meeting was held in New York, Jan. 17, and the following officers chosen: President, Alfred P. Boller; vice-president, Gustav Lindenthal; secretary and treasurer, Eugene W. Stern, 103 Park avenue, New York. Members of council for one year, Gustav Lindenthal, Ralph Modjeski, John F. Wallace; for two years, Gen. T. A. Bingham, Rudolph Hering, C. O. Mailloux; for three years, Alfred P. Boller, J. E. Greiner, C. C. Schneider. The main object of the institute is to promote the business interests of the consulting engineer, by advocating a code of ethics, professional practice and schedule of charges; by acting in pertinent legislative matters, and by urging the separation of the contractor from the designing engineer. The membership is limited to those actively engaged in the independent practice of the profession of engineering, in any of its branches as consulting engineer and who are not engaged in contracting. The institute is the outgrowth of a local association of consulting engineers, organized in New York City in 1905, now expanded into one of national scope.

American Chemical Society—The forty-third general meeting, held at Minneapolis, Dec. 28 to 31, was attended by 275 members and guests. Owing to the fact that over 175 papers were presented, it was necessary to hold meetings of all of the divisions and the meetings of the divisions of Agricultural and Food Chemistry Fertilizer Chemistry, Pharmaceutical Chemistry, Industrial Chemists and Chemical Engineers, Physical and Inorganic Chemistry and Organic Chemistry, were well attended. At the Biological section 44 papers were presented of a strictly chemical nature bearing upon biochemical problems. The meeting of the Section of Chemical Education proved decidedly interesting and the discussion was general.

On the first day of the meeting the chemists all gathered in general session to listen to eight general addresses; also to the address of the retiring president, Wilder D. Bancroft, on "A Universal Law"—an exposition of the general application of the theorem of LeChatelier to all kinds of natural phenomena. The social functions included complimentary smoker in the rooms of the Commercial Club; several receptions and teas for the ladies, and the banquet which was attended by some 200 members. Excursions to several places and works were taken by the members and a large number were treated to a sight-seeing trip covering the cities of Minneapolis and St. Paul.

Alexander Smith was chosen president; Louis Kahlenberg, Frank K. Cameron, George B. Frankforter, E. C. Franklin and E. G. Love, councilors-at-large. M. C. Whitaker was elected editor of the *Journal of Industrial and Engineering Chemistry* and the report of a committee recommending a decided broadening of the policy of that journal was adopted. The secretary announced a net gain of 550 members for the year, the society now having over 5100 members.

Editorial Correspondence

Reports from our own Representatives on Important Events from Many Important Mining Centers of the World

San Francisco

Feb. 2—The bonding of the Champion mines to the North Star Mines Company, in Nevada county, is accepted by mining men as conclusive evidence that large properties in California must be operated by big capital. The successful installation of what is claimed to be the biggest gold dredge in the world by the Natomas Consolidated of California, at Rebel Hill, on the American river, is further proof of the demand for large operation.

The committee on mines and mining in the present State legislature has favorably considered a bill providing for the appointment of an inspector of mines with a view to the protection of miners and laborers and the inspection of underground work. The bill provides for a salary of only $2400 per year, which is not likely to be accepted by a competent man, unless the position and the salary may be added to that of the State mineralogist.

The demand for portland cement has attracted prospective capital in the immediate locality of the town of Salinas. The limestone formation on the Gabilan ranch is considered of a character and quality equal to the requirements of cement manufacture, and several thousand acres including the limestone have been bonded by the owners, J. and H. Bardin, to Hugh Center for six months, providing for purchase at a price which is said to be $60,000.

The Southern Pacific Company is reported to be preparing for the building of a road from Grants Pass, Ore., to Crescent City, in Del Norte county, California, with a view to tapping the copper region of Siskiyou county. The Great Northern also is said to be looking toward a line in that neighborhood, from Medford, Ore., into the Blue Ledge region, which includes the copper and timber lands on the watersheds of the Klamath river.

Butte

Feb. 1—The miners' union is attempting to secure legislation for the benefit of the miners and with that end in view it has appointed a committee to appear before the legislature committee on mines and mining. Four things are demanded by the union: (1), that no powder be used underground until the end of each shift, except in places where the smoke will not affect the men working; (2), that in all places underground where the temperature is in excess of 80 deg. F., six hours shall constitute a day's work; (3), that proper provision be made for pure drinking water and for toilets, and; (4), that in places where considerable stoping is done there shall be raises run at reasonable intervals for ventilation purposes.

The annual report of the Alice Gold and Silver Mining Company has recently been sent to the stockholders by Secretary Allen. From the report it appears that during the four years preceding April 30, 1910, the company lost $22,000. At that time the company sold all its assets to the Anaconda Copper Mining Company, which has since paid into the Alice company's treasury two quarterly dividends of 50c. each on the Anaconda stock received by the Alice company in return for its property. The report states that a plan is now under consideration to dissolve the Alice company and distribute its assets pro rata among its shareholders.

The newly discovered phosphate beds, near Melrose, Mont., have attracted considerable attention and as a result 33,950 acres of land have been withdrawn from entry. The deposits are similar in character to those of southeastern Idaho and western Wyoming from which shipments have been made for several years.

Denver

Feb. 3—Apparently the building of railroads is to open several coalfields in Colorado this year. On the north, the Laramie, Hahns Peak & Pacific will reach its big 60-ft. seam of subbituminous coal during the summer, and will then reach out for the anthracite of the Elkhead district in Routt county. The Saratoga & Encampment railroad, running south from Walcott, on the Union Pacific, is also after the anthracite traffic, only about 50 miles distant from its present southern terminus at Encampment. On the south, the Southern Pacific has obtained rights-of-way and secured terminals at Durango and Farmington, and will thus render available for development and production the large area of coal lands in the vicinity of Durango which that company acquired several years ago at a cost of $1,250,000. Two railways are also projected westward from Meeker, along the White river, to the Colorado-Utah line, through what is known as the Danforth Hills coalfield, one coming down from the north via Steamboat Springs, and the other from the Denver & Rio Grande at Newcastle, to Meeker and westward. The Denver, Laramie & Northwestern, now building, has a seam of coal 14 ft. thick in Wyoming, about 200 miles from Denver with a maximum grade of 2 per cent. and that only for a short distance. So our fuel supply is assured.

In the matter of the Northern coalfield strike, John McLennan, of the Colorado State Federation of Labor, has brought charges against Judge Greeley W. Whitford, who sentenced 16 striking miners from Lafayette to jail, to the effect that he did not give them a fair trial in many ways. Representative Ardourel, chairman of the house committee, appointed to investigate the charges against the judge, says that the committee will meet at the office of the speaker of the house today, to hear the evidence, and if it is considered that the case warrants it, will recommend that the senate sit as a court to try the jurist. Representatives of the labor unions of Pueblo, Cripple Creek and Colorado Springs arrived yesterday and joined the Anti-Injunction League, which is a confederation of 30 labor unions of Denver, in a parade as a demonstration of protest against the action of Judge Whitford, and a memorial has been presented to both houses of the legislature, asking for the impeachment of Judge Whitford. The result is not known at this writing. Verily the life of a judge who tries to do his duty is not a happy one. The Master Builders' Association, however, in an open letter to Judge Whitford, upholding his action, declares that if the time has come when the decision of the courts, and laws enacted by the legislature are to be decided by parades in the streets, it is time for the citizens to "get busy" and let the courts and lawmakers know what they think about it. The parade, they declare, has no other purpose than intimidation.

The Leyden coal mine, 17 miles from Denver, and owned chiefly by the Moffat crowd, in which 10 men were killed a month or so ago, is to be reopened. A new shaft will be sunk half a mile west of the old No. 2 shaft, which is also being restored; both shafts are to be lined with concrete and steel. The No. 1 shaft will be restored in the same manner. A school has been started at the mine for the purpose of teaching the miners the use of oxygen helmets and pulmotor machines, and 14 oxygen helmets will be

placed permanently at the mine. J. C. Roberts, the Government mine-rescue expert, is directing the work of the school. This mine was producing about 700 tons of lignite per diem, and supplied the Denver City Tramway Company's power plant.

In projecting transportation and drainage tunnels in various mining camps, the great obstacle to success was the refusal of many of the companies or owners who would benefit thereby to contribute to the expense of the work. This has happened at Cripple Creek, Idaho Springs and many other places; in fact, it always happens. Now a bill is to be introduced in the State legislature, asking for authority to create mine-drainage districts, providing that the money needed shall be raised by special levy against all mining property to be benefited in a certain district. The passing of such a measure will be of tremendous benefit to the State, as many mine operators in various camps are anxious and ready to commence tunnel-drainage work, and are only deterred by the hoggish attitude of the few who know they will be benefited but will not "ante." It would also be of great advantage and incentive in the building of the next deep-drainage tunnel at Cripple Creek, for which estimates are now being prepared by the tunnel engineer. The flow from the present tunnel is now 7300 gal. per minute.

Salt Lake City

Feb. 2—The Government mine-rescue car No. 4, with headquarters at Rock Springs, Wyo. was in Salt Lake, Jan. 25 and 26. This car will cover the southwestern part of Wyoming and all of Utah. A demonstration was given at the Y. M. C. A. in the use of the rescue apparatus, as well as an illustrated lecture on first aid to the injured by Dr. M. J. Shields, field representative of the American Red Cross Society. This was well attended. The car, while in the city, was open to the public. On the return trip the car stopped at Garfield and later a two months' tour of the coal-mining camps of the State will be made, during which time instruction will be given to miners. S. S. Smith was in charge.

The camp of the Utah Mines Coalition near the head of Big Cottonwood Cañon was wiped out by a snowslide early in the morning of Jan. 31. The slide was a result of rains almost continuous throughout the week and especially heavy for two days previous to the accident, and rising temperature. This gave added weight to the snow, causing a number of slides at Alta and in both of the Cottonwoods. There were 22 men at the mine, three of whom were killed, and three injured. Several of the office force, including General Manager Strickland, who was at the property on a trip of inspection, had a premonition of impending danger, and took their bedding from the office, camping in the main tunnel on the night before the slide occured. They were awakened at about 5.30 a. m., to find the mouth of the tunnel covered with snow and débris. After about two hours' work they dug their way through, and met miners, who had escaped from the bunk-house, and were digging in to meet them. The bunk-house, office, compressor plant, blacksmith shop, and tool house were wrecked or swept away by the slide. Several of the miners were dug out of the wrecked buildings uninjured. A party was sent to Brighton on skis, and telephoned to Salt Lake and Park City for assistance, which arrived during the afternoon. The camp was abandoned, and the dead and injured brought down on sleds through Big Cottonwood, late in the afternoon and evening. More slides are expected. While all the buildings are wrecked, the damage to the machinery is thought not to be great.

A second slide occured in Peruvian Gulch about 8 a.m., killing one of the two men who were working at the Peruvian mine. Later in the day, a third slide occured at Alta from the mountain across from the town, but did not extend far enough to do damage. Alta has suffered from slides in past years, usually in the spring, one of which destroyed most of the buildings, and killed a number of people.

Ottawa, Can.

Feb. 2—The House of Commons committee on railways and canals, comprising a large majority of the members of the House, took action at today's session which will add 2500 miles to Canada's railways. One measure approved was the bill incorporating the British Columbia & Dawson Railway Company (capital $10,000,000). The incorporators and provisional directors are Belvidere Brooks, John W. Kendrick, William C. Pratt, Jean Walkenstein, Andrew T. Sullivan, Edmund C. Harris, of New York, and James O. Clifford, of Chicago. The road is to run from Lytton, B. C., along the Fraser river to Fort George to the mouth of the Stewart river, following the latter by way of Stewart lake, Thatcher river, Trembular lake, Middle river, North Tacla lake, Driftwood river and Bear lake, passing through Fort Connelly, thence along the valley of the Skeena river to a summit between the Skeena and the Stickine rivers, down the Stickine to Telegraph creek and thence up Telegraph creek to the head waters of Teslin river, following the same to the northern boundary of British Columbia, and from there on by the most feasible route to Dawson, in the Yukon territory; also from Ashcroft in British Columbia to the Fraser river near where Big creek enters it; also from a point at or near Lillooet, along the south side of Seaton and Anderson lakes, via Lillooet lake and river and Harrison lake to Vancouver. Total mileage, more than 1000.

Toronto

Feb. 4—The iron and steel interests are urging on the Dominion government the restoration of the bounty on steel rods which expires in June next, contending that the tariff changes under the agreement with the United States will be disadvantageous to them. Manager M. J. Butler, of the Dominion Steel corporation, is in Ottawa endeavoring to influence the Government to retain the bounty.

Owing to an accident at Ragged Chutes power at the Cobalt camp has latterly been very low, resulting in a falling off in production. It was expected that it would be shut off altogether at the end of the week and that it would be some days before the normal amount would be again available. The smaller and more isolated mines using hydraulic air have either been cut off or working intermittently for some time.

Alamos, Sonora

Jan. 28—The revolutionary disturbance in northwestern Mexico have had the effect of causing the suspension of operations in several western Chihuahua districts, owing to the impossibilities of getting in supplies over the usual routes. Practically all communication eastward to Chihuahua and El Paso has been cut off for weeks and the mine operators have been obliged to ship bullion via Sonora points and to get in supplies the same way. The Dolores mine, belonging to the Mines Company of America, recently shipped a bullion consignment of about 100,000 pesos, via Tonichi, on the Yaqui River railroad to Guaymas. La Republica mine shipped bullion out via Alamos. The "insurrectos" have scrupulously respected the property and rights of Americans in all cases. The movement of the trouble now seems to be to the Sonora districts, about Sahuaripa.

The Palmarejo company, an English corporation, operating near Chinipas, Chihuahua, is installing extensive mine and mill equipment. In all nearly a million dollars will be spent. The machinery is tirely from German manufacturers, and the attempt of these foreign machinery makers to deliver the heavy machinery on record time as contracted is watched with interest (and amusement) locally. The mill is being remodeled; a 15-k.m. cable installed and electrical power, using the old canal about 12 miles long. The property has been in the hands of the English company for about 20 years, and in all more than $6,000,000 has been expended and the dividend returns have been about one-third of this or less.

The Mining News

Reports of New Enterprises. New Machinery. Installations. Development Work and Property Transfers. The Current History of Mining

Alaska

An item of considerable interest to the mines in the vicinity of Cordova and the interior is the reduction in the freight rate on the Copper River & Northwestern Railway. The reduction amounts to approximately 30 per cent.; and on a number of items such as coal, hay, grain, gasolene and powder, will amount to 50 per cent.

Contracts have been let for sinking six oil wells at Katalla. Two wells for the Amalgamated Oil Company, two for Clark Davis, and two for Camp 7. Assessment work for 1910 has been completed on these claims.

Finch & Campbell, of Spokane, have purchased holdings on Cañon creek, near Cooks inlet, and extensive hydraulic operations are planned for the early spring.

Fidalgo-Alaska Copper—This company will spend $25,000 to improve its property on Fidalgo bay. Wharves, bunkers and an aërial tramway will be built. T. J. Donahue, J. Y. Ostrander and Charles Schlossen, Cordova, are owners.

Beaver Dam—A tunnel is being driven on this property, 40 miles from Valdez, and the installation of a stamp mill is being considered.

Seward Gold—This company has just purchased a 10-stamp mill to be running by May 15. S. E. Likes, Seward, is superintendent.

Kenai-Star—This company has taken over a number of claims on Cook's inlet, and will install a stamp mill this spring. George L. Chase, Hope, is interested.

Mineral Creek—Preparations are being made to install a stamp mill on the property on Mineral creek, six miles from Valdez. B. F. Millard and J. M. Lathrop have charge of work.

Arizona

Gila County

Miami—Rumors have been current for some time that Miami was having difficulty with its new mill and that an unsuccessful attempt had recently been made to start concentrating the ore. In a despatch to the *Boston News Bureau*, J. Parke Channing says: "These rumors are without a shred of foundation. Not a pound of ore nor a gallon of water has gone into the new mill. It will take about two weeks more to get the power plant and pumping station in running condition before we can start. Our mill is the result of over two years' careful work in a test mill under the guidance of Professor Richards, coupled with the experience of Mr. Burch, whose Nacozari and Morenci mills have been giving most excellent results without the necessity of being rebuilt or remedied. I believe that metallurgically and mechanically we have the best copper mill in the world and that its saving will be higher and the costs lower than any other." Our own information is to the effect that the delay in starting the Miami mill has been due to trouble with the water pipe-line, a cast-iron construction, which failed to withstand the pressure and has had to be replaced in part.

Inspiration—During January ore reserves were increased by over 1,300,000 tons of developed and 200,000 tons of partly developed ore; total on Feb. 1, 17,328,000 tons of developed and 4,409,000 tons of partly developed ore, averaging 2 per cent. copper.

Graham County

Arizona Copper—The report just made public shows, for year ended Sept. 30, 1910, a surplus of £225,653, after reserving £20,000 for capital outlay.

California

Amador County

Oneida—Fairly good rock is being found by the leasers along the south side of Oneida valley in parts of the mine that have not been extensively prospected. A shaft has been sunk 100 ft. to get rid of the clay mixed with the ore near the surface. The Oneida is an old mine lying between the Kennedy and the South Eureka, near Jackson, which after an idleness of several years was reopened 15 years ago by a three-compartment shaft in the hanging-wall.

Bunker Hill—In the six months ended Dec. 31 the 20-stamp mill crushed 18,173 tons of ore, dropping 179 days 11 hours, and averaging about five tons per stamp per day; bullion produced amounted to $131,322. Actual operating expenses totaled $88,012: Labor, $43,233; electric power, water and mine and mill supplies, $29,250; new hoist and partial mill construction, $15,539. Dividends were $60,000, leaving a surplus on Jan. 1, 1911, of $58,691.

Kennedy Extension vs. Argonaut—The hearing of this damage suit has been continued to April 3. The request of the Kennedy to be allowed to raise from the 1400-ft. level of the Argonaut to the present workings of the Kennedy is not agreeable to the Argonaut, even though the plaintiff company agrees to pay for the use of the machinery. The defendant company avers that the shaft is crowded with work, and that if so interrupted the mine could not keep the mill tonnage up to the requisite.

Eureka—A 95-ft. air and timber shaft has been completed, and ore is being taken out from the Cooley channel.

Butte County

Another diamond is reported to have been found in the Cherokee district, north of Oroville, by Benjamin Utz. It is said to weigh 1½ carats. Utz also found a stone, pronounced good and sold to a local jeweler, about a year ago near Oroville on property owned by the Diamond Match Company.

Burlington Gold Mines—This property has been listed on the San Francisco Stock Exchange. The claims (124 acres) are situated in the Forbestown district 23 miles east of Oroville. W. W. Stow, former owner, is reputed to have produced over $1,000,000 with a 60-stamp mill. Directors are W. C. Ralston, H. T. Creswell, G. W. Grayson, E. B. Braden, W. S. Graham. Treasury stock is being sold for development and equipment.

Calaveras County

California-Calaveras Mining Company vs. Wall et al—This suit to set aside a trust deed made to secure an indebtedness of $100,000 has been transferred from the United States circuit court at San Francisco to the superior court of Calaveras county. The suit arises from the sale of the Alta mine situated between Telegraph City and Knights Ferry, and includes 7200 acres of the Rancho Estanilaus, sale price reported $300,000. The stockholders of the company sueing are chiefly residents of Chicago; they are represented by Paul Brown of that city. The hearing will be continued April 4.

Eldorado County

Carpendar—This gravel property comprising about 70 acres located on what is claimed to be one of the richest of the old channels in Eldorado county has been contracted for sale by its owner, W. P. Carpendar, of Smiths Flat, near Placer-

ville to George H. Hayes. The contract price and terms have not been made public. The purchaser has surveyed a road and will haul in machinery and supplies and reopen the mine.

Hope Mining Company—The capitalization of this company is $200,000. Gravel claims embracing 412 acres near Placerville will be mined. The directors chiefly residents of Modesto are H. Benton, R. M. Williams, J. S. Wootten, B. Burger, J. F. Campbell.

Fresno County

Numerous locations and relocations have been recorded in the latter half of January, including quartz gravel placer, and oil claims. The greater number of these locations are oil placers in the region northwest of Coalinga, near the foothills of the Coast range.

Nearly $100,000 worth of labor on oil lands is represented in a single list from the books of the county recorder in the last half of January. The largest items are $45,000 for labor by the Southeastern Limited Oil Company on the Round Mountain group, $20,000 by the Light Oil Extension Company.

Humboldt County

California Mining and Dredging Syndicate—The flume of this company at Orleans on the Klamath river in the northeastern part of Humboldt county, which was broken by the heavy snows in the middle of January, has been repaired and the water turned on for operation. A steady precipitation of rain followed the snow and supplied an abundance of water for mining purposes.

Kern County

In the last half of January a large number of mining and oil locations were filed with the county recorder in various mining and petroleum districts, including two whole sections in the Mojave mining district, which were located as oil lands. Some of the mining locations designate gypsum as the mineral exposed in the cropping but the actual purpose of these filings is believed to be the development of petroleum.

Early Sunrise Mining Company—W. A. Penrod, of Santa Ana, superintendent, reports that he has encountered a fairly good vein containing a 2-in. streak of pay ore. The initial cost of the property, four years ago, was about $8000, and a like amount has been expended in development work. The tunnel is in about 1000 ft. and will be driven to connect with a shaft which missed the vein.

Mariposa County

Original—The construction of ore-bins and other buildings and surface improvements are in progress at this mine near El Portal on Merced river where a promising orebody has recently been developed. The mine is owned and operated by men who are resident of Merced; G. W. Engenhoff, superintendent.

Mt. Gaines Mining and Milling Company—Work has been resumed in mine and mill of this property near Hornitos.

Crown Lead—In addition to the new 20-stamp mill recently erected at this mine near Coulterville, the company is installing an air compressor and other modern mining machinery: An aërial tramway connects mine and mill. The property consists of claims extending about 16,000 ft. along the strike of the southerly end of the mother lode region, and has been operated intermittently for a number of years.

Nevada County

Champion Mines Corporation—The properties of this corporation situated one mile west of Nevada City have been bonded to the North Star Mines Company with a six-months option of purchase. The purchase price and details of negotiations have not been made public. The bonded property includes more than 20 claims, mostly old producers. The deal was negotiated by J. M. O'Brien, of the Sultana group, who represented the North Star, which fact gave rise to a rumor that the North Star was about to purchase the Sultana. This is the biggest mining deal that has been made in Nevada county in 20 years or more.

Murchie Mines Company—It is believed that the litigation involving the mining properties operated by this company is in a fair way toward a settlement that will enable the labor claimants as well as other creditors to secure settlements, and that the mine will resume work.

Sacramento County

Natomas Consolidated of California—This company has completed and put in operation at Rebel hill on the American river between Natoma and Folsom a new dredge known as Natomas No. 8, construction cost reported to be about $250,000. The capacity is 600 cu.yd. per hour handled with buckets of 15 cu.ft. capacity. The first trial run was made Jan. 22, and on the following day the dredge was put in operation under inspection of officers of the company, making a continuous run of 7½ hours, which was considered a record run for a new boat. The construction was superintended by L. D. Hopfield. The head offices of the company are in the Alaska commercial building, San Francisco; Newton Cleaveland, general manager.

Shasta County

Western Gold Dredging Company—This new incorporation, O. E. Sheppard, Redding, president, capitalized for $25,000, has purchased a Du Bois suction dredge formerly operated by the Consolidated Gold Dredging Company. The boat was sunk in Sacramento river, and the new company formed of five former employees of the old company will resume dredging on the river north of Redding.

Tehama County

Northern California Gold Mining Company—This new incorporation, capital stock $100,000, F. H. Mack president, is organized to explore old workings on Nunes bar in the Sacramento river near the Shasta county line, north of Red Bluff. This bar contains about 250 acres; it was worked by placer miners in the early fifties. The present company has prospected the bar for gold and platinum to a depth of 40 ft., and installed a steam shovel, centrifugal pump, and Doak gas engine. The head office of the company is at Oakland.

Colorado

Clear Creek County

Crown Point & Virginia—This property, on Seaton mountain, which has been closed down for several years, is to be worked by W. Renshaw, who has a lease and bond. The advent of the Central tunnel into that section has caused the water to recede from the 800-ft. shaft and a force of men will be employed at once in developing new territory. In early days surface workings produced $500,000.

Gilpin County

Old Town—Pike & Co., leasers, have received settlement for 18 tons of ore; net profit $83 per ton.

Chase—Shipments from the 500 level of this property, in the Russell district, are reported to give returns of 15 oz. gold and 21 oz. silver for first-class, and 6 oz. gold and 19 oz. silver for second-class ore.

Baker—Sommers & Co., on this Quartz hill mine, recently shipped about 6442 tons of smelting ore that returned $93 per ton, 21 tons of screenings yielding $17 per ton, and 60 tons of mill ore.

Lake County—Leadville

Nevada—The shaft has been unwatered and the level is being cleaned out preparatory to searching for the high-class lead ore discovered in the upper workings.

Kankaka Tunnel—The tunnel is in 2000 ft. from the portal in Birdseye gulch, and is being pushed ahead to tap the London fault.

Crown Point and Pinnacle—At this property, on Rock hill, the shaft has been re-timbered, drifts cleaned out, machinery installed and underground work started.

Progressive—The work of unwatering the shaft has been commenced, and the manager is making plans for the development of the property.

SAGUACHE COUNTY

Rawley Mining Company—The driving of a 6000-ft. development and drainage tunnel to tap the vein at the 1200-ft. level is to be begun, probably under contract. There are 7000 ft. of workings. This is a close corporation, composed main'y of New York men.

SAN JUAN REGION

Slide—A streak of argentite ore 10 to 18 in. wide has been cut in this mine in Galena basin operated under lease by Lew Loveland and John Yeager.

Vermillion—In the Rattle tunnel of this mine at Animas forks an 8-ft. vein carrying 20 per cent lead, 62 oz. silver and 0.8 oz. gold is reported to have been cut.

Gold King—A development crew has been employed for several months at this Silverton property.

Silver Ledge—Workings are being extended on to the north on the third, fourth and fifth levels.

Iowa—The galena streak encountered in the South drift has widened to 12 in. in 60 feet.

SUMMIT COUNTY

In the Frisco section, the King Solomon tunnel has now been driven 4871 ft., and has cut, it is said, 11 veins which will be developed by the manager, S. H. Alexander. The Mary Verna tunnel, also near Frisco, is in 3,000 ft. The Surprise mine, on Chief mountain, is also driving a tunnel to develop at depth a vein which shipped high-grade ore in the early days.

TELLER COUNTY

El Paso—It is reported that in the Charles Ladd lease, on block 28 on Beacon hill, the vein is 3 ft. in width, and gives high gold returns. The fifth and sixth levels are being worked on company account. With 30 sets of leasers there are about 200 miners engaged.

Vindicator—Cole & Co., leasing on block 6 on Bull hill, are producing about 500 tons of 1-oz. gold ore per month. The annual report gives the production for 1910 at 33,150 tons; value, $944,105. The profit from mining, after deducting freight, treatment and total mine expenses, is $216,308. Cash balance after payment of $180,000 in dividends, was $125,-951.

Pride of Cripple Creek—From this mine, on Ironclad hill, 24 cars of ore were shipped in January. It is stated that in the lower workings there is a vein 5 ft. in width that is producing ore of about 1 oz. gold value.

American Eagles—Four carloads of ore, carrying from 2 to 5 oz. gold per ton, are reported to have been shipped recently in one day by the Colorado Mines and Investment Company, leaser from Stratton's Estate.

Anchoria-Leland—In this Gold Hill mine eight sets of leasers are breaking and shipping $12 to $20 ore.

Ajax—In this mine, on Bull hill, there are over 20 sets of leasers at work. Vanatta & Co., leasing on the 400 level, are said to have 4 ft. of ore that is yielding 3 oz. gold per ton.

Elkton—From the Elkton dump, White & Alexander are shipping three cars per month of $8 to $10 ore.

Free Coinage—The Altman Leasing Company, operating the 450-ft. level of the Pinto, are said to have struck a new 4-ft. vein of ore rich enough to bring the the average grade of Pinto ore up to $60 per ton.

Stratton Estate—The Ophir May, on Bull hill, is shipping three carloads of 2-oz. gold ore per week to the Portland mill. White & Co. are leasers.

Strattons' Independence—The production for December was 2633 tons of ore averaging 18 dwt. 6 gr. per ton; low-grade mine and dump ore milled, 9619 tons; net profits were $10,929, less $1900 for special development.

Idaho

COEUR D'ALENE DISTRICT

Caledonia—Manager McKinnis reports that the tunnel has advanced 125 ft., and that the heavy ground encountered last month has been passed. He denies circulated rumors that the property is leased from Bunker Hill & Sullivan. Only a small orebody crossing the end line between the 300- and 500-ft. levels is being worked under royalty to the Federal company. Receipts have arrived from Land Office for the 34 acres claimed.

Indiana

GIBSON COUNTY

The coal mines in the Oakland City district are having the dullest period of the year and many miners are idle. The Winslow mines, employing 200 men, are shut down, and Ayrshire mine No. 4 is running with only part of the force. The Massey mines are running only part time.

A showing of oil obtained in well drilling in this field has caused a great deal of interest. While the wells so far completed may not prove paying ventures, 10 ft. of oil sand were penetrated and the formation has the appearance of nearing a productive territory. Operators watching the results are hopeful.

GREENE COUNTY

Twin Oak Coal Company—Incorporated to mine coal, clay and other minerals. The principal office will be in Linton, Ind., and the mining will be done in Greene county.

Island Valley—This mine has closed for two weeks on account of scarcity of orders. The mine has had a continuous full-time run for nearly eight months.

KNOX COUNTY

Bicknell and Glen Ayr—There has been a strike for three weeks. The board will endeavor to settle the disputes in a few days.

OWEN COUNTY

Stewart Coal Mining Company—Articles of incorporation have been filed with the Secretary of State; capital stock is $4000. Sherman W. Stewart, Serug Demarcus, C. F. Allison and J. H. Murphy are directors.

SULLIVAN COUNTY

Belleview—The holdings of the company, consisting of a mine near Carlisle, and 800 acres of leased coal land, were sold at public auction.

VERMILLION COUNTY

Miners in the Clinton field complain of the miners' trains, and have taken their grievance to the president of the district union. The miners are asking for better cars and better handling of the trains for transporting them to and from the mines.

The operators charge 50c. a man each two weeks, and pay the railroad company $75 a month for each mine for the trains. The average mine employs about 250 men and they ride on the trains about which there is much complaint.

Clinton Field—All the mines in the Clinton field have resumed operation; about two-thirds time has been the average during the month of January.

VIGO COUNTY

Hall-Zimmerman—A force of men have started sinking on the 200-acre tract of coal land owned by the Vigo Clay Company, west of Terre Haute.

Sugar Valley—This company is installing a new over cast and otherwise improving the ventilation in the mine, near West Terre Haute, and the Deep Vein mine has resumed operations.

Minnesota

CUYUNA RANGE

A recent report claimed the finding of rich ore on section 4, township 45, range 29, but more recent information is to the effect that the material found was in part low-grade ore, but mostly schist.

Rogers-Brown Ore—It is reported that this company has awarded the contract to the New York Foundation Company for its third concrete shaft, to be sunk in the near future, on the northwest quarter of section 11, township 46, range 29. The shaft will be similar to the others which the Foundation Company has sunk for the Rogers-Brown Com-

pany, and will contain five compartments. The overburden in this vicinity is about 60 ft.

Inland Steel Company—A brick office building has been erected on section 11, township 46, range 29, where the company is preparing to sink a shaft.

Oliver Iron Mining—This company expects to open a new property near Gilbert in the spring. The property is said to lie between the Mariska mine and the Gilbert-Bender mine. The former property has an estimated tonnage of 200,000 tons; the latter 11,095,000 tons. The new property is to be worked by underground methods.

Hobart—This mine is expected to resume operations in the spring, after a cessation of activity for the last two years, due to legal entanglements in connection with the title.

VERMILLION RANGE

Aimar—The finding of ore running up to 63 per cent. iron in No. 2 shaft, at a depth of about 40 ft. is reported on this property on section 15, township 62 north range 14 west. The directors are L. L. Culbertson, E. J. Bunker, C. A. Lannigan, W. A. McClaran, Dr. E. J. Bowers and Elois Elmer.

North American—The shaft, recently completed by the New York Foundation Company is 6x14 ft. in section and 98 ft. deep. A steel shaft house, 65 ft. high, will soon be erected by the American Bridge Company. The plant is equipped with two 200-h.p. boilers, a hoist capable of hoisting five tons from a depth of 1500 ft., and an eight-drill compressor. The shaft is now progressing at a rate of about 50 ft. per month.

Minnesota Steel and Iron—Satisfactory ore has been found and this company, controlled by T. J. Walsh and associates, expects soon to erect a mining plant similar to that installed at the North American Mining Company's property.

Rice Bay Development—This company is exploring land in section 35, township 63, range 15, held under option at a royalty of 25c. per ton. There is a 100-ft. shaft on the property and a diamond drill operating from the bottom of this shaft is reported to have encountered marketable ore at a depth of 30 feet.

Missouri

Foristell—A deposit of Cartnaginian marble was discovered a few years ago, five miles from Floristell, on the Wabash railroad. It is on the property of Frederick Schrader, has been tested in some places to a depth of 1000 ft. and has a known extent of about 80 acres. Samples tested at Columbia and Washington universities were of a quality equal to the Tennessee gray marble.

Montana

BUTTE DISTRICT

North Butte—On the Edith May vein the east drift on the 2200-ft. level has been driven 100 ft. and the ore encountered is of good grade. On the 1600-ft. level of the Jesse vein a crosscut has been driven into the hanging-wall and a band of ore 3 ft. wide encountered. On the 1700-ft. and 1800-ft. levels the band is shown to have widened out to between 6 and 10 ft. and the same body will be prospected for on the 2000-ft. level where the west drift has disclosed an orebody 150 ft. long averaging 6 ft. in width and assaying 6 per cent. copper and 7.5 oz. silver.

Davis-Daly—It is learned that F. A. Heinze has invested about $60,000 for the company in securing working bonds on two gold properties, in Alaska and Porcupine, and has made a concession to the demands of the New England shareholders allowing them to appoint three new directors and two more members on the executive board, thus giving them a majority in the management.

DEER LODGE COUNTY

At the Revenue mine the new ore bins are nearing completion and shipments will be begun shortly to the Washoe smeltery. Ore containing free gold has recently been encountered. At the Trilby mine adjoining the Holdfast, an additional force of men has been put to work. The last shipment of ore from the Hidden Lake group returned over $38 per ton.

FERGUS COUNTY

New Year—The mine and mill have recently been turned over to the newly organized Rheingold Mining Company by Joseph Meredith, formerly receiver of the property and operations will be begun at once, after a shutdown of several years, due to dissension among the various owners.

GRANITE COUNTY

Ole Roland, John Lawlor, Thomas McGrath, Tim Calnan and Joseph Lekpe have recently secured a lease on the Venezuela mine and commenced operations. It is reported that Pat Wall and others have secured an option from Yegen Brothers on the Gold Coin property which was recently examined by C. B. Clark.

Hidden Lake—Regular shipments are now being made and a body of good gold ore has recently been opened. The leaching plant recently installed is giving satisfactory results.

JEFFERSON COUNTY

Hollyland—W. O. Williams has recently struck a 17-in. vein of high-grade gold and silver ore. The property is situated in the Jefferson City district.

Amazon Development—A 4-ft. vein bearing silver, lead and copper, has recently been cut in the face of the 350-ft. crosscut tunnel. Drifts will be started on the vein.

LINCOLN COUNTY

Montana Silver and Lead Mining—A new tunnel which will give a depth of 1200 ft. is being driven from the Cherry Creek side of the property. A compressor will be installed.

MADISON COUNTY

Activity is noted among leasers in the vicinity of Virginia City and some of the ore being shipped to the Washoe smeltery at Anaconda will average over $100 per ton. Interest is being displayed locally in the possibilities of the old river channel between First lake and Granite creek which is covered over by wash. The Easton and Pacific properties are among the steady producers.

Winnetka—Superintendent Bell states that a mill will be erected on the property as soon as the weather permits. Weekly shipments are being made.

Apex—The management states that a 10-stamp mill will be built.

Mt. Royal—Machinery has arrived for a 60-ton cyanide plant; an air compressor has been installed and development work is being pushed at the Shakespear group of mines 15 miles southwest of Phillipsburg. The cyanide plant will be completed early in the year.

Southern Cross—The leaching plant has been shut down and the men in the mill laid off, although it is stated that the results have been entirely satisfactory. The mill has been running on waste ore from the dump, crushing about 6000 tons since fall. The miners are still at work.

SANDERS COUNTY

Jim Fisk—A 50-ton shipment, taken from a 2-ft. pay streak is now ready.

YELLOWSTONE COUNTY

Republic Coal—No. 2 mine recently produced 1622 tons of coal in an eight-hour shift which is claimed to be the Montana record. In accordance with the provisions of the October agreement semi-monthly pay days have been instituted.

Nevada

NYE COUNTY

Ore shipments from Tonopah for the week ended Jan. 28 were: Tonopah Mining, 3200 tons; Belmont, 2057; Montana-Tonopah, 1057; Tonopah Extension, 980; West End, 375; Midway, 50; total 7719 tons, the estimated value being $192,975.

WHITE PINE COUNTY

Giroux—The annual report for the year ended Dec. 31, 1910, states that 9,620,000

tons of 1.36 per cent. porphyry ore have been developed by churn drilling, that will yield 262,070,000 lb. copper. The mine is expected to produce high-grade smelting ore in the next three or four months. The company has cash available $444,726, besides which the Butte & Ely, a subsidiary company, has $242,037, a total of $686,763. The total assets in excess of liabilities are $1,431,084. First-mortgage bonds aggregating $40,400 in par value were retired during the year, leaving a balance now outstanding of $202,700. The 600-gal. pump on the 1200-ft. level of the Giroux shaft went into commission on Jan. 30 and is handling the water with great ease. The 1200-gal. pump on the same level will go into commission within a few days. A station has been cut on the 1400-ft. level of the Giroux shaft and work of raising the remaining three compartments of the shaft has commenced and should be completed to the 1200 level in about four weeks.

New Mexico

Grant County

Chemung—Preparations are being made to resume operations at this property in the Burro mountains. A pump weighing about four tons has been moved from Copper Flat to Tyrone and will be installed at No. 2 shaft.

Socorro County

Ernestine—In the week ended Jan. 21, 655 tons were milled. A completed examination and sampling of the property have been completed.

Deadwood Mines—Tank wagons are being used to deliver crude oil for the De La Verne engine.

Gold Dust—East and west drifts are reported to have advanced 250 ft. in ore.

Mogollon Gold and Copper—At the Cooney raising from the main tunnel is reported in progress.

Pennsylvania

Bituminous Coal

Maryland Coal Company—This company has sold its mine at St. Michael in Cambria county to the Berwind White Coal Company, and the new owner took charge Feb. 1. The price paid has not been announced, but is reported to be not far from $1,000,000. The St. Michael mine was completed last year; the main shaft is 700 ft. deep, with pumping and hoisting plants and steel tipple of the latest design. There is also a miners' town built by the company. The property includes about 3000 acres of coal land.

Texas

B. W. Hess, of Marathon, reports a deposit of nitrate of potash in Brewster county.

Utah

Officials of the International Smelting Company and Salt Lake route have had conferences relative to constructing a railroad line from Tintic to Ely, Nev. Surveys have been made and the line would be about 100 miles long. It would connect with the Giroux mine at Ely, and traverse several mining camps including Deep Creek, where are large deposits of silver, lead and copper ores. The proposed line would probably be the means of providing the Tooele smelter with a large tonnage of ore in addition to the output from Giroux.

Juab County

Beck Tunnel—The drift being driven for the Uncle Sam orebody is in about 400 ft., and it is thought there remain about 50 ft. yet to be driven.

Emerald—Work is being carried on from the 2000-ft. level of the Opex by this company, in search of the Centennial-Eureka ore system.

Iron Blossom—The showing in and about the cave is reported to be good. The ore is soft, and no powder is required in mining, though all work must be caught up and timbered immediately. In places the ore is 60 ft. wide, and is stated to run high in silver. Lead ore is being blocked out from a raise above the 500-ft. level.

Uncle Sam—Production is reported to be in the neighborhood of $1000 a day, with 14 men working on ore. More ore is being developed than extracted. The main stope has followed the body for 280 ft., and is still in ore. In places it is 50 to 60 ft. in width.

Yankee—Development is being done in search of the Colorado orebody from the 300-ft. level of the new shaft. A continuation of the orebody in dispute between the Uncle Sam and Beck Tunnel is expected about 100 ft. below the main tunnel. The shaft is down about 1500-ft. and good progress is being made in sinking, in spite of having to raise water daily. No rock is being brought to the surface, but is being dumped into the large cave encountered some time ago.

May Day—The mill is handling about 30 tons of ore daily. Mill ore will be obtained from some of the leases which expired Feb. 1.

Victoria—The crosscut on the 1000-ft. level broke into ore recently about 30 ft. from the station. New ore bins are being built.

Midnight—Work is being done on these claims near Canon siding in East Tintic. The tunnel has reached the 150-ft. point.

Sioux Consolidated—Work is being continued on the shipping ore in the winze, mentioned previously as being 12 ft. in width.

Gold Chain—The pipe line between the compressor and the mine is laid.

Salt Lake County

Bingham-New Haven—A considerable cave occurred recently in one of the stopes. It is understood that preparations for smelting an increased tonnage are being made by the International.

Utah Copper—Three sections of the Arthur mill will be completely remodeled within 30 days, to handle as large a tonnage as that for which the mill was originally designed.

Utah Mines Coalition—The second orebody in the tunnel has been followed 200 ft. to the west. The face shows ore 1½ ft. wide at the top of the drift, and 3½ ft. wide at the bottom. Assays run from 60 to 100 oz. in silver, and 10 to 12 per cent. lead with some gold. About 8 ft. a day is being driven and from 12 to 15 tons of first-class ore mined. Shipments have been interfered with by the last storm but will be resumed.

Summit County

Grasselli—This company's zinc plant at the lower end of Park City is reported to have been shut down to make some repairs and changes in the machinery. Little concentrates have been turned out since the first of the year. The auxiliary plant built to treat tailings along Poison creek has had a tryout, but has not yet been placed in commission. Electric power is used.

Silver King Coalition—The strike recently made on the 1550 level is being drifted on in two directions. From four to five mine cars of carbonate ore carrying galena are being taken out daily in development. A shipment of 41,000 lb. was made the week ended Jan. 27.

Virginia—Work in the California property has opened a vein up to 6 ft. in width. An average of several samples from above the old workings gave 22.1 per cent. zinc, 7.36 oz. silver, 13.17 per cent. lead, and 60c. gold. The Virginia company's lease will expire Oct. 1.

Washington

Chelan County

Washington Iron and Steel—Buildings have been erected and the construction of the smeltery at Blewett will be begun.

Ferry County

McKinley—Bids for 50 ft. of crosscutting in the bottom of the 150-ft. shaft are being asked. The property is at Orient; $25,000 will be spent for improvements.

West Virginia

Braxton County

C. H. Taney, of Wheeling, and J. J. Williamson, of Bridgeport, O., have brought suit to enforce a sale of coal land in this county, which they claim to have made to the Pittsburg-Buffalo Coal Company.

BROOKE COUNTY

Steubenville & Panhandle Coal Company—Work has begun on a tract of 500 acres near Wellsburg.

MINGO COUNTY

Turkey Gap Coal Company—A new washing and electric plant is being installed at the Freeburn colliery at Delorme.

Canada

The following are the returns of ore movements for the week ended Jan. 28: Boundary, 36,371 tons; Rossland, 4752 tons; Slocan-Kootenai, 4234 tons; total shipments, including the estimated milling, were 45,347 tons, and for the year to date, 136,042 tons. British Columbia Copper Company's receipts, 12,653 tons; Granby smeltery, 21,881 tons; Consolidated company, 7127 tons; total receipts, including concentrates, 41,661 tons, and for the year to date, 124,676 tons.

NOVA SCOTIA

Dominion Steel Corporation—General Manager M. J. Butler states that the company is at present turning out 800 tons of pig iron per day. The output of steel per month is 26,500 tons, the rail output 13,000 tons and the production of rods from 8000 to 9000 tons. The rail market is in an exceptionally healthy condition owing to activity in railroad construction. The company has three cargoes of rails on the way to Prince Rupert, making the voyage round the Horn. About 3000 men are employed at the steel plant and about 1500 more getting out iron ore and limestone.

ONTARIO-COBALT

Little Nipissing—An investigation of the company's books has definitely ascertained that an over-issue of authorized stock has been made. This issue has not been in excess of the company's capitalization of $1,500,000, but so far as can be learned, 1,250,000 shares have been issued the receipts for which do not show on the books. A special meeting of shareholders has been called for Feb. 17.

McKinley-Darragh—At the annual meeting held Jan. 31 the report of the retiring general manager, P. A. Robbins, was presented, showing silver recovered during 1910 amounting to 2,226,766 oz. from the McKinley-Darragh and 412,778 oz. from the Savage, of a total estimated value of $1,426,856. The net profits of 1910 were $983,043; ore reserves on Jan. 1 were 6,041,500 oz. The cost of production of the McKinley-Darragh was 14.50c. per oz., and of the Savage 21.21 cents.

Temiskaming—Good ore is reported at a depth of 540 ft. in a winze sunk from the 500-ft. level, this being the deepest working in the camp.

Beaver—The main shaft has almost reached the 400-ft. level. A station has been cut at the 350-ft. level and a crosscut is being run to pick up the main vein. On the 300-ft. level No. 5 vein has opened up into a rich oreshoot, 11 to 16 in. wide, which is better than any of the ore shoots at 200-ft. depth.

Badger—Four of the directors of the Crown Reserve were elected directors of the Badger on Feb. 1 and Colonel Carson became vice-president.

ONTARIO—PORCUPINE

Hughes—These claims, about half a mile to the north of Porcupine lake, on which free gold was recently found in a 10-ft. vein, have been bought by the Flynn Brothers, of the Porcupine Gold Mining Company. Stripping is being done under direction of Thomas J. Flynn and a shaft will shortly be put down.

Porcupine Exploration—This company has recently acquired 28 gold claims, including the McPortland & Morris claims in Tisdale; seven McRae claims in Whitney, the James Ryan claims, Deloro; and the three Lindberg claims, Tisdale. Hugh H. Sutherland is in charge of work, and stripping operations on the McPortland & Morris and Lindberg claims are stated to have resulted in good showings.

Mancha-Newman Syndicate—Work has been begun by a force of 20 men on a group of 13 claims in southeastern Deloro.

Leyson—These five locations in North Whitney near the Scottish Ontario have been sold by A. J. Young, of North Bay, to Major Vane.

Foster—These locations have been purchased by F. Augustus Heinze, of Butte, Mont., and associates.

Mexico

Pacific Smelting and Mining—According to its second annual report, the company had on Dec. 31, 1910, cash and accounts receivable totaling $157,159; accounts payable, $134,900. Walter Harvey Weed has been appointed consulting geologist.

CHIHUAHUA

Alvarado Mining and Milling—As a result of a recent test conducted by Dave Fennessy, consulting engineer, assisted by William Nordholm, of the Minneapolis Steel and Machinery Company, and L. A. Watts, of the Allis-Chalmers Company, the power plant was accepted. James I. Long is general manager of this Parral operation.

Veta Colorado—Machinery in the new Parral plant is being given a thorough trial. A scarcity of labor is reported.

Iguana—P. B. Butler has leased this mine, east of Parral, and will develop.

Santa Ines—Shipments of a car a day are being maintained from this property, near the Palmilla. Over 100 men are employed. Sarabia and Botello in charge.

Argentina y Anexas—This group, in the Minas Nuevas district, is reported to have been sold by Alvino Garcia y Hermanos and associates to a Mexico City syndicate for a sum stated as about $300,000.

Alfarena—The shaft has been sunk over 40 ft. The Alvarado company recently purchased this property from the Hidalgo Mining Company. I. N. Stanton is mine superintendent.

JALISCO

Zapote—This group of copper properties, adjoining the Magistral, Ameca district, is reported to have been bonded to E. A. Montgomery, of Los Angeles, for $100,000.

SONORA

The Manhattan Exploration Company, of New York, is operating extensively in the Yaqui river region of Sonora. The company has under development the following properties: The Promontorio, La Mesita and Magistral, all in the vicinity of La Dura. M. S. MacCarthy, of Alamos, is general manager.

Penn-Sonora Mining—An increase in the working force and adition to equipment are being made.

Con Virginia Mining—Moderate operations are being carried on under the direction of the Banco de Sonora.

Mina Mexico—The present workers announce that the smeltery will be blown-in by the first of March.

El Tajo Mining—An average of four cars of concentrates per month is exported to the El Paso smeltery.

Africa

RHODESIA

Gold production in December is reported at 47,367 oz., or 9791 oz. less than in November. For the 12 months ended Dec. 31, the total was 616,904 oz. in 1909, and 612,656 oz.—or $12,663,600 in 1910; a decrease of 4248 oz. Other mineral production in December included 15,117 oz. silver, 57 tons lead, 5526 tons chrome ore, 25 tons asbestos and 13,615 tons coal.

WEST AFRICA

Gold production of the Gold Coast and Ashanti in December was 15,042 oz. For the 12 months ended Dec. 31, the total was 235,972 oz. bullion in 1909, and 185,493 oz. in 1910; a decrease of 50,479 oz. The bullion reported in 1910 was equal to $3,674,087, or 177,750 oz. fine gold.

Asia

KOREA

Oriental Consolidated—The gold production for January was $150,500.

The Markets

Coal Trade Review

New York, Feb. 8—Little new is reported from the coal trade in the West. There is still a surplus of coal at the chief consuming centers, but the cold weather and the severe storms which have prevailed over a large part of the country will help to correct this by increasing consumption and at the same time impeding transportation. Mines generally are less active than they were.

The seaboard bituminous trade continues dull; demand for steam coal is light. Miners and dealers alike are hoping for improvement as spring trade opens.

Anthracite trade is quieter than usual and consumption is light for the season. Some mines are beginning to shorten time and reduce production.

Coal and Coke Railway—It is reported that negotiations are going on for the sale of this road to the Baltimore & Ohio. The line extends from Elkins, W. Va., to Charleston, with several branches, about 196 miles in all. It serves a number of mines, and its purchase would bring some important coal traffic to the Baltimore & Ohio.

Coal Traffic Notes

Coal shipments of railroads in the Southwestern Association—covering Missouri, Kansas, Arkansas and Oklahoma—in 1910 were 8,800,000 tons, a decrease of 4,371,000 tons from 1909; the result of the practical suspension of mining from April to September.

Anthracite shipments in January were as follows, in long tons:

	1910.	1911.	Changes.	
Reading	1,185,122	1,134,280	D.	50,842
Lehigh Valley	873,640	1,021,447	I.	147,807
N. J. Central	617,009	772,130	I.	155,121
Lackawanna	829,786	863,371	I.	33,585
Del. & Hudson	489,290	611,758	I.	122,468
Pennsylvania	550,272	591,917	I.	41,645
Erie	547,125	678,531	I.	131,406
N. Y., Ont. & West.	214,374	230,683	I.	16,309
Total	5,306,618	5,904,117	I.	597,499

Total increase this year, 11.3 per cent. All the companies showed gains except the Philadelphia & Reading. The tonnage this year was unusually large for January.

Coastwise shipments of coal from chief Atlantic ports, year ended Dec. 31, long tons:

	Anthracite.	Bitum.	Total.	PerCt.
New York	15,036,622	11,289,095	26,325,717	60.6
Philadelphia	1,980,830	4,700,174	6,681,004	15.4
Baltimore	272,695	3,780,120	4,052 815	9.3
Newp't News	.....	2,817,701	2,817,701	6.5
Norfolk	.....	3,534,134	3,534,134	8.2
Total	17,290,147	26,121,224	43,411,371	100.0
Total, 1909.	16,655,391	24,111,488	40,766,879	.....

Total increase in 1910 was 2,644,492 tons, or 6.5 per cent. New York includes all the harbor shipping points; Norfolk includes Sewalls Point.

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

New York

ANTHRACITE

Feb. 8—Anthracite trade has been quiet, so far as domestic sizes are concerned. A heavy snowstorm this week is interfering with harbor and local deliveries, and the touch of winter may stir up trade a little. Steam size trade is fair, with rice and barley a little short.

Schedule prices for domestic sizes are $4.75 for lump, $5 for egg and stove and $5.25 for chestnut, all f.o.b. New York harbor. For steam sizes current quotations are $3@3.25 for pea; $2.40@2.75 for buckwheat; $1.95@2.25 for buckwheat No. 2 or rice; $1.40@1.55 for barley; all according to quality, f.o.b. New York harbor.

BITUMINOUS

The seaboard soft-coal trade continues disappointing, but dealers are looking forward to a good spring trade. For the present New England buying is light, and harbor trade is dull. The snowstorm has impeded deliveries this week.

Prices are about the same. Gas coals bring $1@1.10 at mine for ¾-in., 95c.@$1 for run-of-mine, and 70c. for slack. Fair steam coals can be had for $2.60. f.o.b. New York harbor, lower grades down to $2.35@2.45, with better coals up to $2.85@2.90. Present demand is chiefly for the lower-priced coals.

Car supply is good. Transportation is held up by the storm. There is plenty of coal at tide, however, and delays may help to clear off some of the stocks.

In the coastwise trade it is hard to get vessels on account of the stormy weather. Quite a number are locked up at Eastern ports. This situation, however, is only temporary. Rates are a little irregular for the time being. In a general way 80@90c. is paid for larger vessels from Philadelphia to Boston and Portland. Small boats get 65@75c. from New York to points around Cape Cod; 40@55c. to Providence and Sound ports.

Birmingham

Feb. 6—The railroads are working hard in the Birmingham district to keep up with the demand for cars. The weather has been like spring for several weeks now but that does not appear to disturb the market conditions. Considerable development is on throughout Alabama in the coalfields and several new mines are being opened. Coal prices which have been better for four or five months past than for a couple of years heretofore, are being maintained. Coal shipments to Southern ports are being increased right along as transportation service is supplied.

Coke is still in good demand with the production kept steady.

Chicago

Feb. 7—A flat market has continued for coal, both western and eastern, in the last week. Large supplies from nearly every source have led to price cutting. Operators are beginning to lesseen shipments to this market, and the process should continue until the ratio of demand to supply becomes greater. Mild weather is largely responsible for this condition, and the old tendency to make Chicago a dumping ground for coal not sold elsewhere seems to be increasing. The result is forced cutting of prices to escape demurrage charges. At the beginning of this week receipts are being lessened by delays on the railways and this has a tendency to stiffen prices, though the effect probably will be but temporary. Much Illinois coal, this market's chief supply, has been sold at sacrifice prices in the last week, the only strong size being screenings. Steam coals as well as domestic need a condition of smaller supply or greater demand, or both, to strengthen the market.

Illinois and Indiana lump, very weak, sells for $2@2.55; run-of-mine for $1.65@1.75 and screenings for $1.50@$1.65. Of coals from east of Indiana, the strongest is smokeless, which has been restricted in shipments and has held up well to the circular prices of $3.95 for lump and $3.30 for run-of-mine. Hocking is rather weak, with the circular price of $3.40 cut at time to $3.10. Anthracite moves steadily, though lightly, with supplies of all sizes plentiful.

Cleveland

Feb. 6—Coal trade is quiet, with light demand both for steam and domestic supplies. Factories are beginning to use a little more than they have been; but there is plenty of coal in stock. Car supply is good.

Prices are nominally unchanged, but the market is rather weak.

Indianapolis

Feb. 6—There has been a slump in the coal-mining business in the block coal-

field. The bottom has fallen out of the market. The mines have been running full time for many months and the lull which is now in the market is the first for some time.

Other mining operations are quiet, and quite a number of mines are on short time. Reports from the consuming centers are not favorable.

Pittsburg

Feb. 7—The Monongahela River Consolidated Coal and Coke Company has shipped down the river on the present rise 19,364,000 bu. coal, or about 735,000 net tons. The first coal went out shortly after Jan. 1 and the last yesterday, today's water being sufficient only for the lighter craft, of which none is ready, while all heavier loaded craft have gone down. The coal market continues unsatisfactory, mines running at only about 50 per cent. of capacity, being cut deeply; so we repeat last week's quotations as representing actual selling prices: Mine-run and nut, $1@1.10; ¾-in., $1.10@1.20; 1¼-in., $1.20@1.30; slack, 82½@85c. per ton at mines. Demand for slack is good relative to supply, as production of slack is decreased, owing to the mines running so slowly.

Yesterday the board of directors of the Pittsburg Chamber of Commerce approved the report of the transportation committee on the Pittsburg-Lake coal rate, to the effect that there is gross discrimination in favor of certain other fields, particularly West Virginia. Feb. 9, the Chamber of Commerce will act on the report, but opinion is divided as to whether it will be approved or not. Last Saturday a formal complaint was made to the Interstate Commerce Commission, the leader in the movement being John W. Boileau, of Pittsburg.

Connellsville Coke—The tone of the market is somewhat improved, operators holding to formerly quoted prices and looking for a heavier movement. A few deals are under negotiation, but the work proceeds very slowly, and no important transactions can be noted for the week. We continue to quote: Prompt furnace, $1.45@1.50; contract furnace, $1.50@1.60; prompt foundry, $2@2.10; contract foundry, $2.25@2.50 per ton at ovens.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ending Jan. 28, at 291,705 tons, a gain of 4000 tons, and shipments at 3037 cars to Pittsburg, 4772 cars to points west and 739 cars to points east, a total of 8548 cars.

St. Louis

Feb. 6—The coal market has been completely demoralized owing to the unprecedented weather. Last Wednesday the thermometer registered 84 deg. This is the hottest January day on record for over 40 years. The average temperature for the past month has been from 55 to 60 deg. This period of depression is aggravated by the contrast from the period of extreme prosperity through which the trade had just passed, during which period the tonnage of the mines in Illinois increased on an average fully 20 per cent.

The average mine is running only about two days a week and prices are down to the cost of production and a good deal of demurrage coal has been sold at even less. Operators realize that the best part of the winter is over and that there is scarcely any chance of conditions improving until the fall rush commences in August. Operators have called a joint meeting of all the operators in Illinois and Indiana at Chicago, Feb. 10, to see if they cannot figure out a solution of the problem.

Screenings are getting scarcer and advancing in price owing to the small production of lump. Standard screenings especially are high and they are bringing 50@60c. per ton at mine.

Current prices in the St. Louis market are as follows:

	Mine.	St. Louis.
Illinois, Standard:		
6-in. lump and egg	$1.10	$1.62
2-in. lump	1.00	1.52
Mine-run	0.90	1.42
Screenings	0.60	1.12
Trenton:		
6-in. lump and egg	2.25	2.77
3-in. nut	2.00	2.52
Staunton or Mt. Olive:		
6-in. lump	1.50	2.02
2-in. lump	1.25	1.77
Mine-run	1.20	1.72
Screenings	0.60	1.12
Carterville:		
6-in. lump or egg	1.30	1.97
3-in. nut	1.20	1.87
Mine-run	1.10	1.77
Screenings	0.75	1.42
Pocahontas and New River:		
Lump or egg	2.25	4.75
Mine-run	1.25	3.75
Pennsylvania Anthracite:		
Chestnut	....	7.20
Stove or egg	....	6.95
Grate	....	6.70
Coke:		
Connellsville foundry	....	5.40
Gas house	....	4.90
Smithing	....	4.15

Prices at East St. Louis are 20c. per ton below the St. Louis quotations.

Anthracite—The market is naturally getting dull; dealers are all beginning to hold off as they do not desire to carry anything over until next season. Some fairly liberal price concessions have been made in order to clean up demurrage stuff.

FOREIGN·COAL·TRADE

United States Coal Imports—Imports of coal and coke into the United States, year ended Dec. 31, long tons:

	1909.	1910.	Changes.
Anthracite	2,125	162	D. 1,963
Bituminous	1,257,629	1,991,943	I. 734,314
Total coal	1,259,754	1,992,105	I. 732,351
Coke	170,671	156,417	D. 14,254

Canada furnished this year 1,675,692 tons of coal and nearly all the coke; Australia, 240,899 tons of coal; Japan, 55,948 tons of coal. Imports are chiefly on the Pacific Coast and in the far northwestern States. Anthracite imports not reported since July 1, 1910; those given above are for six months only.

United States Coal Exports—Exports of coal from United States ports, with coal furnished to steamships in foreign trade, year ended Dec. 31, long tons:

	1909.	1910.	Changes.
Anthracite	2,842,714	3,021,627	I. 178,913
Bituminous	9,693,843	10,784,239	I. 1,090,396
Total exports	12,536,557	13,805,866	I. 1,269,309
Steamer coal	6,114,248	6,450,750	I. 336,502
Total	18,650,805	20,256,616	I. 1,605,811
Coke	895,461	879,073	D. 16,338

Canada took in 1910 a total of 10,531,085 tons, or 76.3 per cent. of the exports. Cuba took 858,776 tons of coal. The coke went chiefly to Mexico and Canada. Of the steamer coal in 1910 there was 5,499,815 tons loaded at Atlantic ports; 569,081 at Gulf ports; 129,128 at Pacific ports, and 252,726 tons at ports on the Lakes. Nearly 60 per cent. of the bunker coal was loaded at New York.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of coal on Jan. 21 as follows: Best Welsh steam coal, $4.26; seconds, $4.08; thirds, $3.90; dry coals, $3.84; best Monmouthshire, $3.84; seconds, $3.66; best small steam coal, $2.40; seconds, $2.16. All prices are per long ton, f.o.b. shipping port, cash in 30 days less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, Feb. 8—That there is more activity in the iron and steel trades is apparent. Orders are coming in more freely and it is said that specifications on contracts are also better. We hear of mills starting up and furnaces going into blast. In fact fears are expressed in some quarters that there may be too great haste in this movement, and another period of overproduction may follow. The increase in production is most apparent in steel.

In pig iron there have been orders placed, but generally for moderate quantities. Foundrymen still seem doubtful about the future and unwilling to make commitments far ahead; or perhaps they are convinced that for some time to come they will be able to get iron at present prices. In basic pig there has been more activity.

Structural steel shows some good contracts for building. Two large bridges have been let, both over the Ohio, one at Kenova, W. Va., the other at Louisville. Lake shipyards have taken contracts for some large freight boats. The Cambria Steel Company is to furnish the steel, part of it on a deal for ore. Smaller trade, for bars, wire and pipe, is improving.

The New Haven and Boston & Maine have ordered 61,000 tons of steel rails, all to be open-hearth steel, the order going to the Bethlehem, Lackawanna and Pennsylvania Steel companies. Other smaller rail orders are reported, also an export order for 20,000 tons, taken by the Steel Corporation.

Steel Corporation Exports—In the year 1910 the exports of iron and steel in all forms by the United States Steel Corporation amounted to 1,489,819 short tons—or 1,330,408 long tons—showing an increase of 480,073 tons, or 47.5 per cent. over 1909. The largest item of the increase was in sheets and plates, 100,000 tons; rails and structural steel each gained about 50,000 tons. The total for 1910 was far above the highest previously reported, which was in 1906, and was 1,079,319 tons.

Baltimore

Feb. 6—Exports for the week included 112,000 lb. lead to Belfast and 4,310,000 lb. steel billets to Liverpool. Imports included 4050 tons iron pyrites from Huelva, Spain; 11,050 tons iron ore from Cuba.

Birmingham

Feb. 6—While the pig-iron quotations in Southern territory continue at $11 per ton. No. 2 foundry, there are a few sales being made and the market is considered stronger. The manufacturers of pig iron in this section of the country are not selling iron for delivery during the latter part of the year at prevailing prices. The sales are still in small lots, but the aggregate is good. The presence in the Birmingham district during the past week of some well known iron brokers caused some talk that large lots of iron for future delivery had been sold, but there is no verification of the rumors. The make in the South is still at a low mark.

Charcoal iron is a little more active than it has been, prices still being $22@22.50 per ton. The make is steady.

In the general iron and steel trade, the cast-iron pipe concerns report the most active conditions. The steel industry is picking up. Shipments of steel wire, nails and fencing are good at this time, the Southern Iron and Steel Company reducing its stock on hand and caring for a steady production.

The announcement that the American Bridge Company will put up a plant in this district to cost $1,000,000, which, when in full operation, will give employment to several hundred men, has created considerable interest. The plans for this plant were discussed some time back, it is stated, and it may be some time yet before they are put through to a completion.

Chicago

Feb. 7—The iron market shows increasing sales of iron and steel products, but slow sales of pig iron. Melters are content as heretofore to buy in small quantities, for delivery one to three months hence. An occasional large order does not influence prices to any great extent, and Southern No. 2 continues to be quoted at $11 Birmingham, or $15.35 Chicago, and Northern No. 2 at $15.50@16. These quotations are on the ordinary run of business; it is probable the lower ones are shaded slightly on the larger sales. Both buyers and sellers are in a waiting mood and sellers profess confidence in the firmness of the market, basing their professions on the increasing sales of railroad and structural materials. Inquiries continue to be numerous for second- and third-quarter iron and the general tone of the market is one of quiet that may develop into strength, rather than weakness. Coke is not active, but there is no oversupply and Connellsville holds to $4.90 Chicago.

Cleveland

Feb. 6—Nothing doing yet as to iron-ore prices but there is a growing impression that there will be no change.

Pig Iron—The market has been quiet with sales only of small quantities. Current prices, Cleveland delivery, are $15.90 for bessemer, $14.25 for basic; $14.25 for No. 2 foundry; $13.75@14 for forge. There are reports of shading 10 or 15c. on No. 2 to secure orders.

Finished Material—Orders are in for plates for a new ore boat and for some structural work. Quite a number of contracts have been placed for sheets and for steel bars. Jobbers are quite busy filling up their stocks. On the whole the market is more active than for several months past.

Philadelphia

Feb. 8—The large transactions in pig iron, which have been reported during the last week in this territory are the culmination of negotiations conducted for as long as a month past. Only a few of the larger consumers have been concerned in this activity. Quite a number of heavy consumers are still debating the wisdom of forward buying. Southern makers have succeeded in selling a good deal of material. Eastern Pennsylvania furnace interests have made slight concessions, but are inclined to hold their ground as against the ordinary small buyer. There is more interest in basic pig than for some weeks, but buyers want to see the situation cleared up a little before contracting. Mill owners are not buying forge excepting as they need it. Stove manufacturers are this week showing a disposition to bring negotiations to an early close. There is a strong undertone to the entire market, particularly for foundry grades and important transactions may be completed by the close of the week. The usual quotations for No. 2 X foundry are $15.75; for gray forge $14.50 and for basic $15. There is very little difference in delivery prices between home and southern makes.

Steel Billets—The only business in billets is covered by a few smaller transactions to finish out work in hand

Bars—Some mills report more business and more inquiry, but this is exceptional. The fact is that the output of bar mills in this territory is stationary.

Sheets—Negotiations which pointed to large orders covering deliveries into the summer have failed and the week's business shows a relapse into small orders.

Pipes and Tubes—A good week's business has been closed for the delivery of cast pipe. Merchant pipe continues sluggish. The smaller interests are buying more freely in tubes, but only for new jobs.

Plates—Steel-plate makers speak of more inquiries and several good orders are the outcome of the week's business. The car builders have been heard from in a small way.

Structural Material—Construction requirements for New York and New England have shaped up nicely and a number of good orders have been placed.

Scrap—The scrap market shows improvement. The amount of business done has not been large for the week, but the inquiries and negotiations show that the yards will soon be depleted of the kinds of scrap the mills want.

Pittsburg

Feb. 7—The first week of February finds no particular improvement in the iron and steel trade as compared with the last week in January. There was a steady improvement through that month, but, so far as can be observed, the volume of business is not increasing now, although the gain already made is being held.

The base price of tinplates has been advanced 10c. a box, effective Feb. 4. The advance was caused wholly by the continued advance in pig tin, and the schedule of prices was therefore rearranged, heavier advances being made on the more heavily coated plates, up to 30c. per box on charcoal bright plates carrying 3½ to 7 lb. of tin per box, and up to 60c. per double box on ternes carrying 40 lb. of coating per double box. The new base prices are $3.70 on 100-lb. coke bright plates and $3.45 on 100-lb. coke ternes.

The tinplate advance was effected by a conference held in Pittsburg between the various manufacturers, Feb. 3. A contingent favored an advance of 20 or 25c., to cover the prospective advance in pig tin, as the syndicate is expected to push the market above 50c., but those favoring a 10c. advance, with further

advances upon occasion, prevailed. Demand for tinplate has become brisk and nearly all the idle mills have been started, about 85 per cent. of the leading interest's mills being in operation.

Pig Iron—The price of the 3000 tons of basic, noted last week as being sold to the Forged Steel Wheel Company, was $13.90, delivered Butler, or $13.30, Midland, where the iron came from, the delivered price being equivalent to $13.10, Valley furnaces. The basic market is quotable at $13.25, Valley, 25c. below the nominal quotation named in our reports in the past few weeks, and there is a question as to whether even this price could not be shaded. Bessemer is still $15, Valley, and a sale of 1250 tons, equal tonnages, February to June, inclusive, has been made by a furnace interest to a middle interest, which had already sold such a tonnage to a consumer, the middle interest being allowed a commission out of the $15. Foundry iron continues to be quotable at $13.75, Valley, while malleable is at a minimum of $13.50, Valley, some iron with close specifications being reported as sold at $13.75, Valley.

Ferromanganese — The market continues to be quotable at $38, Baltimore, for prompt and forward delivery, freight to Pittsburg being $1.95; but it is not improbable that the price could be shaded.

Steel—Specifications on contracts for billets and sheet bars have been increasing rapidly. Most consumers of sheet bars, and particularly the tin mills, have specified for February nearly up to their full allotments, and full specifications for March are expected. Billet specifications are somewhat better. A careful inquiry through the market within the past few days failed to develop any concessions possible, and we continue to quote $23 for billets and $24 for sheet bars, either bessemer or open-hearth, f.o.b. Pittsburg or Youngstown. Rods are quotable at $28.50@29, Pittsburg, most mills asking $29 per ton.

Sheets—Demand for sheets has improved slightly, and mills are only running at between 50 and 60 per cent. of capacity. Prices are well maintained: Black sheets, 28 gage, 2.20c.; galvanized, 3.20c.; blue annealed, 10 gage, 1.65c.; painted corrugated roofing, $1.55; galvanized, $2.75 per square.

St. Louis

Feb. 6—The market has opened up in February duller than ever. Scarcely any inquiries have been received and practically no business closed. The general industrial situation seems to be dull and foundries are all running light. The price of $11 per ton, Birmingham, or $14.75, St. Louis, is the prevailing one, though it would be easy to get a concession of 25c. per ton on a contract of any size.

FOREIGN IRON TRADE

Iron Production in Germany—Pig-iron production in Germany, year ended Dec. 31, metric tons:

	1909.	1910.	Changes.
Foundry iron	2,491,919	2,965,810	I. 473,891
Forge iron.....	652,306	644,992	D. 7,314
Steel pig.....	1,099,772	1,372,196	I. 272,424
Bessemer pig.....	412,118	471,366	I. 59,248
Thomas(basic)pig	8,261,538	9,338,961	I. 1,077,423
Total.....	12,917,653	14,793,325	I. 1,875,672

The total increase in 1910 was 14.5 per cent. Steel pig includes spiegeleisen, ferromanganese and all similar alloys.

METAL MARKETS

New York, Feb. 8—The metal markets show no new or unexpected developments, but the tone seems to be improving in some drections.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Dec. 1910..	$1,330,400	$ 4,976,632	Imp.$ 3,646,232
" 1909..	10,579,304	2,083,772	Exp. 8,495,532
Year 1910..	58,774,822	59,222,518	Imp. 447,696
" 1909..	132,880,821	44,086,966	Exp. 88,793,855
Silver:			
Dec. 1910..	6,059,348	4,397,410	Exp. 1,661,938
" 1909..	5,297,965	4,203,696	" 1,094,269
Year 1910..	57,359,261	45,877,128	" 11,482,133
" 1909..	57,592,309	46,187,702	" 11,404,607

Exports from the port of New York, week ended Feb. 4: Gold, $109,925, chiefly to South America; silver, $855,845, principally to London. Imports: Gold, $152,347; silver, $148, 24, from the West Indies and South America.

Gold—The price of gold on the open market in London remained at 77s. 9d. per oz. for bars and 76s. 4½d. per oz. for American coin. Supplies arriving were nearly all taken by the Bank of England.

Platinum—The market is quiet, with prices about the same as they have been for some time. Dealers quote $38.50@39 per oz. for refined platinum, and $41.50@42 for hard metal, 10 per cent. iridium.

Our Russian correspondent reports, under date of Jan. 20, that the market has been dull, with only small sales at unchanged prices. The market is quoted at Ekaterinburg, 7.50 rubles per zolotnik; at St. Petersburg, 32,500 rubles per pood, both for crude metal, 83 per cent. platinum. These prices, however, are nominal and subject to negotiations. The quoted prices are equivalent to $28.20 and $31.85 per oz., respectively.

SILVER AND STERLING EXCHANGE

Feb.	2	3	4	6	7	8
New York....	52⅜	52⅝	52⅛	51¾	52	51¾
London.....	24 5/16	24 1/4	24 1/16	23 7/8	24	23 7/8
Sterling Ex..	4.8615	4.8635	4.8630	4.8620	4.8625	4.8625

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Silver—The market has been weak, and tendency has been downward.. The cause assigned is the prevalence of the plague in northern China. The market closes weak with 23 d. bid in London.

Exports of silver from London to the East from Jan. 1 to Jan. 26, reported by Messrs. Pixley & Abell:

	1910.	1911.	Changes.
India.....	£ 590,500	£ 589,500	D. £ 1,000
China.....	127,000	116,000	I. 11,000
Total.....	£ 717,500	£ 705,500	D. £ 12,000

India Council bills in London brought an average of 16.12d. per rupee.

Copper, Tin, Lead and Zinc

NEW YORK

Feb.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. New York, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
2	12½ @12¾	12.25 @12.30	42½	4.45 @4.50	4.27½ @4.32½	5.37½ @5.42½	5.22½ @5.27½
3	12½ @12¾	12.25 @12.30	41⅞	4.45 @4.50	4.27½ @4.32½	5.37½ @5.42½	5.22½ @5.37½
4	12½ @12¾	12.25 @12.30	41⅞	4.45 @4.50	4.27½ @4.32½	5.37½ @5.42½	5.22½ @5.37½
6	12½ @12¾	12.25 @12.30	41½	4.45 @4.50	4.27½ @4.30	5.40 @5.45	5.25 @5.30
7	12½ @12¾	12.25 @12.30	40⅞	4.45 @4.50	4.27½ @4.30	5.42½ @5.47½	5.27½ @5.32½
8	12½ @12¾	12.25 @12.30	40	4.45 @4.50	4.27½ @4.30	5.42½ @5.47½	5.27½ @5.32½

The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Feb.	Copper. Spot.	Copper. 3 Mos	Copper. Best Sel'td	Tin. Spot.	Tin. 3 Mos	Lead, Spanish.	Zinc, Ordinaries.
2	55 9/16	56	59¼	191¾	191	12⅞	23½
3	55¼	56 1/16	59¼	187¼	187	12 15/16	23½
4	.....	.....	.....	.....	.....	.....	.....
6	55 9/16	56⅜	59¼	187¼	187	13	23½
7	55 1/16	55 13/16	58¾	185¼	185	13⅛	23½
8	54½	55¼	58⅛	181¾	181½	13⅛	23⅜

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £12 = 2.61c.; £23 = 5c.; £60 = 13.04c. ± £1 = ± 0.21¾c.

Owing to an error in transcribing the average price of electrolytic copper in January was given last week at 12.303c.; it should have been 12.295c. When the error was discovered it was too late to correct it, the issue having been already printed.

Copper—The market has been quiet. Consumption in Europe continues good and in this country it is believed to be improving, but manufacturers having recently bought freely and having been confirmed by recent events in their belief that cheap copper may still be had when required are not yet disposed to contract far ahead. On the other hand, the producers have not been disposed to press sales. The market is now fairly well established at the nominal asking price of 12½c., delivered, usual terms, corresponding to about 12.32½c., cash, New York, with concessions of five points, or so, freely made to consummate business. In the sales of the week, European contracts have predominated. In Lake copper a moderate business with domestic consumers has been transacted, special brands having realized up to 12¾c., with good ordinary brands easily obtainable at 12⅝c. At the close Lake copper is quoted at 12½@12¾c.; electrolytic in cakes, ingots and wirebars at 12.25@12.30; and casting copper nominally at 12@12⅛ cents.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire has been reduced ½c., and is now 13½c. base, carload lots at mill.

The London standard market was firm until Tuesday when, in anticipation of unfavorable American statistics the sentiment became bearish and there was free selling, in consequence of which the market declined and closes at £54 10s. for spot, and £55 5s. for three months.

Copper exports from New York for the week were 5922 long tons. Our special correspondent gives the exports from Baltimore for the week at 130 tons.

Tin—The market is declining as rapidly as it lately advanced. The curious feature is the fact that future tin does not show any more pronounced weakness than spot material, thus indicating that the powers that be are not willing to demoralize the market. The trade at large is absolutely at sea about the market. Fairly large transactions took place in this market during the second half of last week, when the metal was about 3c. per pound higher than it is today, but the constant severe declines have taken all the enthusiasm out of prospective buyers and business has become very dull. London closes at £181 15s. for spot, and £181 10s. for three months, while in New York tin can be bought at about 40 cents.

Lead—The market is quiet. A fair business is reported at slightly lower prices, St. Louis being quoted at 4.27½@4.30, and New York at 4.45@4.50. The American Smelting and Refining Company maintains its price of 4.50c., New York, for desilverized, and its contracted product is going into consumption at that price, but in the open market no one is able to realize higher than 4.45 cents.

The London market for Spanish lead is firmer, and at the close is quoted at £13 2s. 6d. and English lead at £13 5s. per ton.

Spelter—The market is quiet but firm. Galvanizers are not well covered. There has been a good inquiry and business is reported at slightly higher prices. At the close St. Louis is quoted at 5.27½@5.32½c. and New York at 5.42½@5.47½ cents.

The London market for good ordinaries closes at £23 7s. 6d. with £23 12s. 6d. for specials.

Base price of zinc sheets is $7.50 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Imports and Exports of Metals

Exports and imports of metals in the United States, 12 months ended Dec. 31, are reported as follows, in the measures usual in the trade:

Metals:	Exports.	Imports.	Excess.
Copper, long tons	315,851	153,766	Exp. 162,085
Copper, 1909....	311,960	143,661	Exp. 168,299
Tin, long tons....	621	46,937	Imp. 46,316
Tin, 1909.....	441	42,567	Imp. 42,126
Lead, short tons.	69,786	105,117	Imp. 35,331
Lead, 1909.....	86,077	110,605	Imp. 24,528
Spelter, sh. tons.	8,748	3,452	Exp. 5,296
Spelter, 1909....	2,899	9,670	Imp. 6,771
Nickel, lb.....	15,244,937	32,050,032	Imp. 16,803,095
Nickel, 1909....	12,048,737	21,916,182	Imp. 9,867,445
Antimony, lb.....	339,685	9,899,514	Imp. 9,559,829
Antimony, 1909.	6,648	9,652,568	Imp. 9,645,920
Platinum, oz.....	47	120,109	Imp. 120,062
Platinum, 1909.	195	118,851	Imp. 118,656
Aluminum, value	$949,215	.....	Exp. $949,215
Aluminum, 1909	567,375	.....	Exp. 567,375
Ores, etc.:			
Zinc oxide, lb. ..	26,333,393	.....	Exp. 26,333,393
Zinc oxide, '09..	29,091,347	.....	Exp. 29,091,347
Zinc dross, lb....	9,457,304	.....	Exp. 9,457,304
Zinc dross, '09..	14,138,898	.....	Exp. 14,138,898
Zinc ores, lg. tons	17,599	74,158	Imp. 56,559
Zinc ores, 1909.	11,121	80,105	Imp. 68,984
Antim'y ores, lb.	.....	.....	.....
Ant. ores, 1909.	504	3,386,708	Imp. 3,386,204
Chrome ore, tons	30	38,579	Imp. 38,549
Chrome ore, '09	30	39,820	Imp. 39,790

Copper, lead and nickel (and antimony from Aug. 5, 1909) include the metal contents of ores, matte, bullion, etc. The exports given include reëxports of foreign material. Zinc contents of ore imported in 1910 were 53,523,140 lb.; not reported prior to date of new tariff. Quantity of antimony ore is not reported from Aug. 5, 1909, only metal contents being given. Imports of aluminum are not reported.

Other Metals

Aluminum—The market is quiet. We continue to quote 21@21½c. per lb. for No. 1 ingots, New York.

Antimony—Business is about the same and prices show no change. Quotations are 8¼c. per lb. for Cookson's, 7¾c. for U. S. and 7¼@7⅜c. for Hungarian and other brands.

Quicksilver—The steady demand and short supply noted last week have resulted in a sharp advance of prices. The New York quotation this week is $46@47 per flask of 75 lb. for large lots; $49@50 for jobbing lots. San Francisco, $46 for domestic orders and $2 less for export. The London price has been advanced to £8 10s. per flask, with £8 7s. 6d. quoted by second hands.

Cadmium—Current quotations are 60@70c. per lb. in 100-lb. lots, f.o.b. New York, according to quantity of metal.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots up to 55c. for 200-lb. lots. The price of electrolytic is 5c. higher.

Zinc and Lead Ore Markets

Joplin, Mo., Feb. 4—The highest price paid for zinc sulphide ore was $44 per ton, the assay base ranging from $36 to $41 per ton of 60 per cent. zinc; scale base price, $39.33 per ton of 60 per cent. zinc. Zinc silicate sold on a base of $20@23 per ton of 40 per cent. zinc. The average price, all grades of zinc, was $38.28 per ton. The highest price paid for lead was $58 per ton, 350 tons in one bin selling at this price. The average price, all grades of lead, was $55.44 per ton.

SHIPMENTS, WEEK ENDED FEB. 4.

	Zinc lb.	Lead lb.	Value.
Webb City-Carterville	4,080,910	900,820	$104,799
Joplin.....	1,747,940	181,530	49,915
Alba-Neck.....	761,080	.....	16,743
Galena.....	432,500	154,920	12,399
Duenweg.....	505,630	77,550	11,605
Oronogo.....	378,230	64,700	8,240
Spring City.....	369,950	25,210	6,590
Granby.....	420,460	14,620	6,210
Miami.....	103,090	150,570	5,302
Carl Junction.....	208,930	.....	4,387
Aurora.....	125,180	43,490	3,677
Carthage.....	146,540	5,310	3,000
Quapaw.....	125,340	10,950	1,924
Jackson.....	95,140	2,130	1,765
Sarcoxie.....	61,760	16,120	1,668
Seneca.....	.....	47,780	1,290
Cave Springs.....	61,780	.....	1,174
Stott City.....	64,100	.....	1,154
Greenfield.....	35,200	.....	317
Totals	9,723,760	1,695,700	$233,159
5 weeks.....	44,748,590	6,986,770	$1,088,979

Zinc value, the week, $186,149; 5 weeks, $894.683
Lead value, the week, 47,010; 5 weeks, 194,296

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1910.	1911.	1910.	1911.	1910.	1911.
January.....	$47.31	$41.85	$45.16	$40.55	$56.99	$55.68
February....	40.69	.....	39.47	.....	53.64	.....
March.....	43.60	.....	39.71	.....	51.26	.....
April.....	41.00	.....	39.33	.....	49.72	.....
May.....	40.19	.....	37.51	.....	48.16	.....
June.....	40.20	.....	37.83	.....	48.80	.....
July.....	39.63	.....	36.80	.....	48.59	.....
August.....	40.13	.....	37.32	.....	49.75	.....
September..	43.45	.....	39.96	.....	54.73	.....
October.....	43.31	.....	40.50	.....	53.18	.....
November...	47.20	.....	43.20	.....	54.80	.....
December...	42.50	.....	40.70	.....	55.70	.....
Year.....	$42.43	.....	$39.79	.....	$52.12	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore: the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

This week's scale base price affords an opportunity of testing the wage scale, effective between the operators and miners, and it was currently reported that settlements for wages this week would be made according to the cut in the price of zinc ore. It is conceded generally that employees will accept the situation philosophically, and that no labor trouble will ensue. The weather situation is such that the output continues to grow, which, with light shipments, is adding weekly to the reserve stock in the bins.

Platteville, Wis., Jan. 28—The base price paid for 60 per cent. zinc ore was $42@43; there is very little high-grade ore to be had and no premium price was paid. The base price paid for 80 per cent. lead ore was $54@56 per ton.

SHIPMENTS, WEEK ENDED FEB. 4.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb
Platteville	989,100	50,000	281,400
Galena	782,300	.....	.....
Benton	772,000	.....	.....
Mineral Point	697,900	.....	.....
Cuba City	134,000	56,560	617,970
Highland	120,600	.....	.....
Harker	79,070	.....	.....
Hazel Green	60,000	119,900	.....
Montfort	.....	60,135	.....
Shullsburg	.....	69,170	.....
Linden	.....	.....	80,000
Total	3,634,970	355,765	979,370
Year to date	14,179,320	1,048,025	4,859,100

Shipped during week to separating plants, 3,126,810 lb. zinc ore.

CHEMICALS

New York, Feb. 8—The general market is slow to improve, and business remains quiet.

Copper Sulphate—The market is more active and quite a number of inquiries are coming in. Prices are unchanged at $4 per 100 lb. for carload lots and $4.25 per 100 lb. for smaller orders.

Arsenic—The shading reported last week has become general, and white arsenic can be had at $2 per 100 lb. The market is dull and heavy.

Nitrate of Soda—Business is improving a little, but prices are unchanged at 2.10c. per lb. for both spot and future positions.

Messrs. Mortimer & Wisner, New York, report the position of nitrate in the United States on Feb. 1 as below, in long tons:

	1910.	1911.	Changes.
Stocks, Jan. 1	14,000	12,790	D. 1,210
Imports, Jan	31,200	77,800	I. 46,600
Total supplies	45,200	90,590	I. 45,390
Deliveries, Jan	26,800	77,190	I. 50,390
Stocks, Feb. 1	18,400	13,400	D. 5,000
Afloat for U. S.	106,500	125,000	I. 18,500

Quantities afloat include all cargoes due to arrive at United States ports by May 15 next.

Imports and Exports—Imports and exports of chemicals and raw materials in the United States, year ended Dec. 31:

	Imports.	Exports.	Excess.
Bleach, lb	101,029,345	496	I. 101,028,849
Bleach, 1909	91,390,004	13,964	I. 91,376,040
Potash salts, lb.	510,191,652	2,187,787	I. 508,003,865
Potash salts,'09	427,382,618	2,332,386	I. 425,050,232
Soda salts, lb	39,183,586	587,704	I. 38,595,882
Soda salts, 1909	15,697,637	1,053,907	I. 14,643,730
Acetate lime, lb.	.....	64,115,674	I. 64,115,674
Acetate, 1909	.....	72,312,173	I. 72,312,173
Nit. of soda, tons	529,172	5,784	I. 523,388
Nitrate, 1909	422,493	8,233	I. 414,260
Phosphates, tons	10,277	1,083,037	E. 1,072,760
Phosphates, '09	6,077	1,020,556	E. 1,014,479
Sulphur, tons	28,647	30,747	E. 2,100
Sulphur, 1909	26,914	37,168	E. 10,252
Pyrites, tons	806,590	.....	I. 806,590
Pyrites, 1909	692,385	.....	I. 692,385
Magnesite, lb.	286,899,745	3,496,662	I. 283,403,083
Magnesite, 1909	84,814,624	877,475	I. 83,937,149
Sul. Ammonia,lb.	184,686,534	1,205,908	I. 183,480,626
Sul. Am'nia, '09	85,829,334	114,214	I. 85,715,120

Exports include reëxports of foreign material. Figures for manganese not reported prior to July 1, 1909; imports above for 1909 are for six months only. Estimating sulphur contents of pyrites, the total imports of sulphur in 1910 were 351,283 tons.

Petroleum

Exports of mineral oils from the United States, 12 months ended Dec. 31, in gallons:

	1909.	1910.
Crude petroleum	170,337,773	180,111,166
Naphthas	68,758,675	100,695,382
Illuminating oils	1,046,401,072	940,247,039
Lubricating and paraffin	161,639,609	163,832,544
Residuum	121,966,249	117,605,802
Total	1,569,103,378	1,502,491,933

The total for 1910 shows a decrease from 1909 of 66,611,445 gal., or 4.2 per cent.

MINING·STOCKS $

New York, Feb. 8—The market on the general exchange has again been rather irregular, prices advancing and then receding without much apparent cause. The general tendency has been upward, however, and on the whole there was some gain during the week. There was also a little more outside interest apparent than has been the case for some time.

On the Curb there was more activity and price movements were generally upward. The Cobalt stocks held their own well, and there was some trading in the Nevada shares. Copper stocks were fairly active. Chino and Giroux sold quite largely and there was some trading done in Ray Central and Ray Consolidated; but they all closed a fraction lower than the highest point. Miami was also active after quite a period of quiet; but it also closed a shade below the highest quotation.

Boston, Feb. 7—Copper shares show signs of improvement. Prices show a gradual hardening tendency although it is certain specialties that are attracting attention. Among these are Giroux, Lake, North Butte and a few others. Pools are working in these issues. The Calumet & Hecla merger is still on and the pros and cons are as thick as ever. Superintendent MacNaughton has been in this city in consultation with the committee appointed by Stock Exchange members. The deductions of this committee relative to the terms offered by the Calument & Hecla Company will likely be made public the latter part of this week.

Local sentiment regarding the merger is only lukewarm. It is acknowledged that while many interests are being gouged pretty hard the frameup as it exists is the best for the greatest num-

COPPER PRODUCTION REPORTS.

Copper contents of blister copper, in pounds.

Company.	November.	December.	January.
Anaconda	21,900,000	21,500,000	21,000,000
Arizona, Ltd	3,010,000	3,224,000	.....
Balaklala	.....	160,000	.....
Copper Queen	7,372,776	.....	7,298,227
Calumet & Ariz	1,930,000	1,900,000	.....
Detroit	1,840,939	.....	2,017,397
East Butte	618,191	870,812	.....
Imperial	*nil*	.....	.....
Mammoth	.....	.....	.....
Nevada Con	5,207,353	5,510,936	.....
Old Dominion	2,754,000	2,287,000	2,095,000
Shannon	1,420,000	.....	1,250,000
Superior & Pitts	2,160,000	2,175,000	.....
United Verde*	3,000,000	.....	.....
Utah Copper Co	7,468,515	7,137,585	.....
Lake Superior*	20,400,000	20,000,000	.....
Non-rep. mines*	13,200,000	13,100,000	.....
Total production.	92,281,775	.....	.....
Imports, bars, etc.	24,835,954	25,192,854	.....
Total blister	117,117,629	.....	.....
Imp. in ore & matte	5,542,279	9,316,091	.....
Total	122,660,608	.....	.....
Brit. Col. Cos.:			
British Col. Copper	917,994	.....	.....
Granby	1,410,261	1,645,613	.....
Mexican Cos.:			
Boleo	.....	2,766,630	.....
Cananea	3,658,000	.....	.....
Moctezuma	1,654,235	.....	1,738,429

Figures are reports received from companies, unless otherwise stated. Boleo copper does not come to American refiners.
*Estimated.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
I, 1910	116,547,287	78,158,387	81,691,672
II	112,712,493	66,618,322	37,369,518
III	120,067,467	62,844,818	40,585,767
IV	117,477,639	67,985,951	31,332,434
V	123,242,476	59,305,222	45,495,400
VI	127,219,188	53,363,196	65,895,948
VII	118,370,003	56,708,175	59,407,167
VIII	127,803,618	67,731,271	61,831,780
IX	119,519,983	64,501,018	75,106,496
X	126,469,284	67,814,172	68,186,912
XI	119,353,463	60,801,992	67,424,316
XII	123,339,219	43,594,018	88,104,075
Year 1910	1,452,122,120	749,426,542	722,431,494
I, 1911	115,696,591	42,078,567	53,208,739

	Visible Stocks.		
	United States.	Europe.	Total.
II, 1910	98,463,339	248,236,800	346,700,139
III	107,187,992	254,150,400	361,338,392
IV	123,824,874	249,625,600	373,450,474
V	141,984,159	246,870,400	388,854,559
VI	160,425,973	239,142,400	399,568,373
VII	168,386,017	232,892,800	401,278,818
VIII	170,640,678	222,320,000	392,960,677
IX	168,881,245	218,444,800	387,326,045
X	148,793,714	211,276,800	360,070,514
XI	139,261,914	198,060,800	337,322,714
XII	130,389,069	193,200,000	323,589,069
I, 1911	122,030,195	187,797,120	309,827,315
II	142,439,490	186,368,000	328,807,490

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

ber. The new Calumet & Hecla stock is quoted $225 bid, $230 asked. The so called subsidiary stocks are seldom traded in so that already Boston is having a taste of what will happen when the merger is completed.

The $2 Franklin mining assessment was paid on over 100,000 shares the day it was due, Feb. 6, out of the 166,000 shares outstanding.

Giroux took a $1 drop to $7 on the issue of the annual report. Miami and Winona have both shown recent strength. Superior & Pittsburg has also shown good demand.

Curb trading has been of fair dimensions, but the only features have been in the penny stocks. Both Algomah and Bohemia show advances for the week.

Assessments

Company.	Delinq.	Sale.	Amt.
Advance, Mont.	Feb. 1	Mar. 1	$0.003
Albion, Utah	Feb. 23	Mar. 27	0.13
Alpha Con., Nev.	Jan. 12	Feb. 12	0.05
Beck Tunnel, Utah	Jan. 10	.....	0.01
Con. Virginia, Nev.	Feb. 7	Feb. 28	0.25
Crown Point, Nev.	Jan. 30	Feb. 23	0.10
East Crown Point, Utah	Feb. 10	.....	0.00½
East Vallejo, Utah	.....	.....	0.00½
Eureka M. & M, Ida.	Jan. 23	Feb. 21	0.000½
Exchequer, Nev.	Jan. 24	Feb. 14	0.05
Florence M. & M., Ida.	Feb. 20	Mar. 22	0.001
Franklin, Mich.	Feb. 6	.....	2.00
Hancock Con., Mich.	Mar. 1	.....	1.00
Helvetia Copper, Ariz.	Feb 15	.....	0.50
Idaho-Nevada Expl., Ida.	Jan. 23	Feb. 23	0.000½
Julia Con., Nev.	Jan. 15	Feb. 16	0.03
Keystone, Utah	Dec. 15	Feb. 16	0.03
Lower Mammoth, Utah	Feb. 11	.....	0.05
Lucky Calumet, Ida.	Jan. 16	Feb. 16	0.005
Lucky Swede, Ida.	Apr. 1	May 1	0.002
Reindeer Cop. & Gold, Ida.	Feb. 1	Feb. 25	0.005
Pac. Gold & Copper, Utah	Jan. 12	Feb. 15	0.00½
Pandora, Ida.	Jan. 30	Feb. 28	0.003
Selma, Utah	Feb. 15	Mar. 15	0.00½
Super'r & Boston Cop., Ariz.	Feb. 20	.....	1.00
Teddy M. & M., Ida.	Jan. 20	Feb. 20	0.002
Treasure, Cal.	Feb. 10	Mar. 3	0.05

Monthly Average Prices of Metals

SILVER

Month.	New York.			London.		
	1909.	1910.	1911.	1909.	1910.	1911.
January	51.750	52.375	53.795	23.843	24.154	24.865
February	51.472	51.534	.....	23.706	23.794	.....
March	50.468	51.454	.....	23.227	23.690	.....
April	51.428	53.221	.....	23.708	24.483	.....
May	52.905	53.870	.....	24.343	24.797	.....
June	52.538	53.462	.....	24.166	24.651	.....
July	51.043	54.150	.....	23.519	25.034	.....
August	51.125	52.912	.....	23.588	24.428	.....
September	51.440	53.295	.....	23.743	24.567	.....
October	50.923	55.490	.....	23.502	25.596	.....
November	50.703	55.635	.....	23.351	25.680	.....
December	52.226	54.428	.....	24.030	25.160	.....
Total	51.502	53.486	.....	23.706	24.670	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	New York.				London, Standard.	
	Electrolytic		Lake.			
	1910.	1911.	1910.	1911.	1910.	1911.
January	13.620	12.295	13.870	12.680	60.923	55.604
February	13.332	.....	13.719	.....	59.388	.....
March	13.255	.....	13.586	.....	59.214	.....
April	12.733	.....	13.091	.....	57.238	.....
May	12.550	.....	12.885	.....	56.313	.....
June	12.404	.....	12.798	.....	55.310	.....
July	12.215	.....	12.570	.....	54.194	.....
August	12.490	.....	12.715	.....	55.733	.....
September	12.379	.....	12.668	.....	55.207	.....
October	12.553	.....	12.788	.....	56.722	.....
November	12.742	.....	12.914	.....	57.634	.....
December	12.581	.....	12.863	.....	56.769	.....
Year	12.738	.....	13.039	.....	57.054	.....

TIN AT NEW YORK

Month.	1910.	1911.	Month.	1910.	1911.
January	32.700	41.25	July	32.695	.....
February	32.920	.....	August	33.972	.....
March	32.463	.....	September	34.982	.....
April	32.976	.....	October	36.190	.....
May	33.125	.....	November	36.547	.....
June	32.769	.....	December	38.199	.....
			Av. Year	34.123	.....

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1910.	1911	1910.	1911.	1910.	1911.
January	4.700	4.483	4.582	4.334	13.650	13.009
February	4.613	.....	4.445	.....	13.328	.....
March	4.459	.....	4.307	.....	13.063	.....
April	4.376	.....	4.225	.....	12.641	.....
May	4.315	.....	4.164	.....	12.550	.....
June	4.343	.....	4.207	.....	12.688	.....
July	4.404	.....	4.291	.....	12.531	.....
August	4.400	.....	4.290	.....	12.513	.....
September	4.400	.....	4.289	.....	12.582	.....
October	4.400	.....	4.271	.....	13.091	.....
November	4.442	.....	4.314	.....	13.217	.....
December	4.500	.....	4.363	.....	13.197	.....
Year	4.446	.....	4.312	.....	12.920	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1910.	1911.	1910.	1911.	1910.	1911.
January	6.101	5.452	5.951	5.302	23.350	23.887
February	5.569	.....	5.419	.....	23.188	.....
March	5.637	.....	5.487	.....	23.031	.....
April	5.439	.....	5.289	.....	22.469	.....
May	5.191	.....	5.041	.....	22.100	.....
June	5.128	.....	4.978	.....	22.094	.....
July	5.152	.....	5.002	.....	22.406	.....
August	5.279	.....	5.129	.....	22.800	.....
September	5.514	.....	5.364	.....	23.165	.....
October	5.628	.....	5.478	.....	23.900	.....
November	5.976	.....	5.826	.....	24.083	.....
December	5.624	.....	5.474	.....	24.019	.....
Year	5.520	.....	5.370	.....	23.050	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1910.	1911.	1910.	1911.	1910.	1911.
January	$19.90	$15.90	$17.98	$14 40	$17.94	$14.75
February	18.96	.....	17.21	.....	17.38	.....
March	18.53	.....	16.93	.....	17.00	.....
April	18.28	.....	16.84	.....	16.75	.....
May	17.10	.....	15.94	.....	16.18	.....
June	16.52	.....	15.60	.....	15.53	.....
July	16.40	.....	15.40	.....	15.40	.....
August	16.09	.....	14.89	.....	15.16	.....
September	15.92	.....	14.73	.....	14.93	.....
October	15.90	.....	14.05	.....	14.88	.....
November	15.84	.....	14.26	.....	14.78	.....
December	15.90	.....	14.15	.....	14.65	.....
Year	$17.10	.....	$15.65	.....	$15.83	.....

STOCK QUOTATIONS

COLO. SPRINGS Feb. 7

Name of Comp.	Bid.
Acacia	‡.04
Cripple Cr'k Con.	‡.02
C. K. & N.	‡.15
Doctor Jack Pot.	.08
Elkton Con.	.74½
El Paso	.77½
Findlay	.05½
Gold Dollar	.12½
Gold Sovereign	‡.02
Isabella	.17¾
Jack Pot	.07
Jennie Semple	.10
Lexington	‡.01½
Moon Anchor	‡.02
Old Gold	.03½
Mary McKinney	.46⅜
Pharmacist	‡.02
Portland	1.00
Vindicator	.89
Work	‡.03½

SALT LAKE Feb. 7

Name of Comp.	Bid.
Beck Tunnel	.19½
Bingham Copper	‡.15
Black Jack	.09
Carisa	.15
Colorado Mining	.39
Columbus Con.	.11
Daly Judge	‡4.45
Grand Central	.62
Iron Blossom	.93
Little Bell	.55
Lower Mammoth	.05
Mason Valley	9.25
Maj. Mines	‡.53
May Day	.08½
Nevada Hills	2.42½
New York	‡.13
Prince Con	.65
Silver King Coal'n	1.90
Sioux Con	.39
Uncle Sam	.60

SAN FRANCISCO FEB. 7.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Alta	.05
Belcher	.73
Best & Belcher	.34
Caledonia	.29
Challenge Con.	.12
Chollar	.14
Confidence	.45
Con. Virginia	‡.76
Crown Point	.73
Gould & Curry	.19
Hale & Norcross	.21
Mexican	1.60
Occidental	.41
Ophir	1.25
Overman	.26
Potosi	.25
Savage	.18
Sierra Nevada	.27
Union Con.	.54
Yellow Jacket	.35

Name of Comp.	Bid.
MISC. NEV. & CAL.	
Belmont	5.92½
Jim Butler	.29
MacNamara	.17
Midway	.14
Mont.-Tonopah	.90
North Star	.05
West End Con.	.55
Atlanta	.13
Booth	.07
C.O.D. Con.	.09
Comb. Frac.	.11
Jumbo Extension	.30
Oro	.04
Silver Pick	.05
St. Ives	.05
Tramps Con.	.03
Argonaut	1.35
Bunker Hill	‡7.25
Cent. Eureka	1.25
So. Eureka	6.50

N. Y. EXCH. Feb. 7

Name of Comp.	Clg.
Amalgamated	66⅜
Am. Agri. Chem.	51⅛
Am.Sm.&Ref.,com	81
Am. Sm. & Ref., pf.	105⅛
Anaconda	40½
Batopilas Min.	2¼
BethlehemSteel pf	62¼
Federal M. & S., pf	59
Goldfield Con.	3¾
Great Nor., ore ctf.	63
Homestake	84
Nat'nalLead,com.	58¾
National Lead, pf.	108¼
Nev. Consol.	19¾
Pittsburg Coal, pf.	72½
RepublicI&S,com.	34⅜
Republic I & S, pf.	99
SlossSheff'd,com.	55
Sloss Sheffield, pf.	‡112½
Tennessee Copper	38
Utah Copper	46¾
U. S. Steel, com.	81⅜
U. S. Steel, pf.	119¼
Va. Car. Chem.	65⅞

N. Y. CURB Feb. 7

Name of Comp.	Clg.
Ariz.-Cananea	3⅜
Barnes King	‡⅛
Braden Copper	3⅞
B. C. Copper	6⅞
Buffalo Mines	‡2.27½
Butte Coalition	18¾
Caledonia	‡⅛
Calumet & Mont.	‡.90
Chino	.22
Cobalt Central	.09½
Con. Ariz. Sm.	1⅜
Davis-Daly	1½
Ely Con.	.37
El Rayo	‡2⅛
Florence	1⅜
Giroux	7⅛
Greene Cananea	6⅝
Greenwater	.05
Guanajuato	3⅜
Guerrero	‡1⅝
Guggen. Exp.	218
Inspiration	8⅛
Internat. S. & R.	‡131
Kerr Lake	7½
La Rose	4⅞
McKinley-Dar-Sa.	1⅜
Miami Copper	20¼
Mines Co. of Am.	5
Mont. Shoshone	.10
Nev. Utah M. & S.	1⅛
Nipissing Mines	11
Ohio Copper	1⅛
Pacific Sm. & M.	⅛
Precious Metals	1⅞
Ray Central	1⅜
Ray Con.	17¾
Red Warrior	1½
South Utah M. & S.	.98
Standard Oil	626½
Stewart	¾
Tonopah	8¼
Tonopah Ex.	1.02
Tri-Bullion	½
Tularosa	⅛
Union Mines	⅜
Yukon Gold	4

BOSTON EXCH. Feb. 7

Name of Comp.	Clg.
Adventure	‡5½
Algomah	8
Allouez	‡35
Am. Zinc	24⅜
Arcadian	‡3½
Arizona Com.	15¼
Atlantic	‡4¼
Bonanza	‡.50
Boston & Corbin	13
Butte & Balak	5⅝
Calumet & Ariz.	53¼
Calumet & Hecla	‡506
Centennial	13
Con. Mercur	.06
Copper Range	68¼
Daly-West	3
East Butte	12⅞
Franklin	10
Granby	36
Hancock	20⅛
Helvetia	‡1
Indiana	13¼
Isle Royale	14
Keweenaw	2⅛
Lake	36¾
La Salle	4¼
Mass.	‡7⅞
Michigan	3
Mohawk	44
New Arcadian	‡3
North Butte	30¼
North Lake	7
Ojibway	7
Old Dominion	40
Osceola	109
Parrot	12
Quincy	69
Shannon	11¾
Shattuck-Ariz.	21¾
Superior	‡38
Superior & Bost.	4⅜
Superior & Pitts.	15¼
Tamarack	45
Trinity	4¼
U. S. Smelting	36½
U. S. Smelt'g, pf.	47
Utah Apex	2¾
Utah Con.	12¼
Victoria	2½
Winona	9
Wolverine	‡120
Wyandot	‡1½

BOSTON CURB Feb. 7

Name of Comp.	Last.
Ahmeek	170
Bingham Mines	1.62½
Boston Ely	.98
Boswyocolo	.08
Cactus	.20
Calaveras	2.06½
Champion	.02½
Chief Cons.	1.43¾
Cons. Ariz.	1
Corbin	4
Cortez	2.12½
Crown Reserve	2.62½
First Nat. Cop.	1.75
Live Oak	19.75
Mackinaw	.14
Majestic	.39
Nat'l Mine & Ex.	.03
Nevada-Douglas	2.10
Oneco	1.87½
Raven Copper	.38
Rhode Island Coal	5.25
San Antonio	5
South Lake	6.50
Trethewey	1⅛
Tuolumne Copper	4⅛
United Zinc, pfd.	5⅛
Vulture	.07⅜
Yuma	.24

LONDON Feb. 8

Name of Com.	Clg.
Camp Bird	£1 15s 9d
Dolores	1 10 0
El Oro	1 6 3
Esperanza	1 13 9
Mexico Mines	7 7 6
Oroville	0 7 6
Stratton'sInd.	0 2 3
Tomboy	0 15 0

‡Last quotation.